The Linguistics Encyclopedia

Third Edition

Edited by
Kirsten Malmkjær

THE ROUTLEDGE LINGUISTICS ENCYCLOPEDIA

The Routledge Linguistics Encyclopedia is a single-volume encyclopedia covering all major and subsidiary areas of linguistics and applied linguistics. The seventy nine entries provide in-depth coverage of the topics and sub-topics of the field. Entries are alphabetically arranged and extensively cross-referenced so the reader can see how areas interrelate. Including a substantial introduction which provides a potted history of linguistics and suggestions for further reading, this is an indispensable reference tool for specialists and non-specialists alike.

This third edition has been thoroughly revised and updated, with new entries on:

- Attitudes to Language
- Conversation Analysis
- English Language Teaching
- Gesture and Language
- Idioms
- Language and Advertising
- Language and New Technologies
- Linguistics in Schools
- Optimality Theory
- Research Methods in Linguistics
- Slang

The following entries have been recommissioned or substantially revised:

Animals and Language, Artificial Languages, Computational Linguistics to Language Engineering, Contrastive Analysis/Contrastive Linguistics, Corpus Linguistics, Critical Discourse Analysis, Dialectology, Discourse Analysis, Dyslexia, Genre Analysis, Historical Linguistics, Intonation, Language and Education, Language, Gender and Sexuality, Language Origins, Language Surveys, Language Universals, Linguistic Typology, Metaphor, Pragmatics, Rhetoric, Semantics, Semiotics, Sociolinguistics, Stylistics, Systemic-Functional Grammar, Writing Systems.

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Preface

You are reading something, or listening to a lecture, or taking part in a conversation about language. You notice an unfamiliar term, or realise that you don't know enough about what is being said to understand. At this point, you should seek out this encyclopedia. Strategies for the use of encyclopedias differ, but this one is designed to allow you to proceed in one of three ways:

- You can consult the index at the back of the book, where you will find the term or subject in question appearing in its alphabetically determined place, with a page reference, or several, which will tell you where in the main body of the work it is defined, described and/or discussed.
- If you are looking for a major field of linguistic study, you can consult the List of Entries immediately before this Preface.
- You can simply dive into the body of the work.

The entries are designed to be informative and easy to access. They do not provide as much information as you will find in a full book on any given topic, but they contain sufficient information to enable you to understand the basics and to decide whether you need more. Each entry ends by listing some suggestions for further reading and draws on many more works than those listed as further reading. These are mentioned in the text by author and year of publication, and a full reference can be found in the Bibliography at the end of the book. Almost all the entries contain cross-references to other entries.

The first edition of this book was published in 1991 and the second, revised and updated edition, some ten years later. The changes to the present, third edition reflect the rapid expansion and developments that have taken place in linguistics and language studies in the current millennium; many entries are new, and many have been recommissioned and substantially updated.

This volume demonstrates the many facets of linguistics, and the Introduction provides a view of its history. But it is likely that people have taken a theoretical interest in language for much longer than the time span covered there. Having language is probably concomitant with wondering about language, and so – if there is one thing that sets linguistics apart from other disciplines – it is the fact that its subject matter must be used in the description. There is no metalanguage for language that is not translatable into language, and a metalanguage is, in any case, also a language. According to one view, language creates reality for us. According to another, it reflects, more or less adequately, what there is. Probably both are true. At least it seems certain that we use our language prolifically to create and change our momentary values, and that, in seeking to understand language, we are seeking to understand the cornerstone of human cognition.

Kirsten Malmkjær
Cambridge, 2009

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All of the editing for the second edition as well as for this third edition has taken place after my move to Middlesex University. I am extremely grateful to the three Deans of School with whom I have worked at Middlesex, Gabrielle Parker, Richard Tufnell and Edward Esche, for their support and for the support of so many other colleagues, particularly Billy Clark and Nicola Brunswick who are among the new contributors to this volume, but also all my colleagues in the Department of English, Languages and Philosophy and in the School of Arts and Education more widely. I cannot mention them all, but particular thanks have to go to those with whom I worked most closely in Translation Studies over the years, Christina Delistathi, newly Yulia Knottenbelt, Abele Longo, until recently Emily Salines, Moritz Schaeffer and Claire Shih.

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I am grateful to the anonymous readers who gave advice on how the second edition could be made an improvement on the first, and the third on the second. I hope they and the contributors like this latest outcome of our joint efforts, even though I have not been able to incorporate every one of the readers' suggestions. Of course, the faults that remain are my sole responsibility.

This encyclopedia was the brainchild of Wendy Morris, then Linguistics Editor at Routledge.

Without her encouragement and guidance, I could not have contemplated taking on such a major commitment at a very early stage in my career. I am grateful to her, and to Steve, Poul and Stuart, who also believed the book would see the light one day, and to Jonathan Price of Routledge for his help in the later stages of editing the first edition. The second edition was greatly speeded on its way by the help and encouragement of Louisa Semlyen, Ruth Bourne and Katharine Jacobson at Routledge. Louisa once again took a leading hand in the production of the third edition, and I have also been tremendously supported in this endeavour by Ursula Mallows, Samantha Vale Noya, Stephen Thompson and Paola Celli.

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K.M.

Introduction

As the present encyclopedia shows, linguistics today encompasses a wide range of component disciplines and associated activities, all of which use the name to announce their commitment to the serious study of language and languages. This (relatively recent) expansion of linguistics means we need to focus on the core of the subject and how it emerged from its nineteenth-century origins as 'the science of language', a phrase which is still taken as a gloss on modern linguistics though not all linguists find it equally congenial.

The roots of linguistics

While the nineteenth century is a reasonably well motivated starting point for modern linguistics, the roots of serious language study lie deep in the past. The development of fully linguistic (i.e. post-pictographic) writing systems entailed not only a conscious awareness of linguistic processes but also an account of how they worked. Only in this way could the knowledge have been preserved and passed on to succeeding generations. This would locate the source of linguistic studies in the literate civilisations of antiquity – Mesopotamia, north India and China, Egypt, etc. – and it was in India that one of the earliest of the great traditions of linguistic scholarship was founded leading to **Panini's grammar of Sanskrit** in the first millennium BC (see Cardona 1990/1994). At much the same time, the Greeks embarked on the codification of their language in a long series of works culminating in the **Technē grammatikē of Dionysius Thrax** (*c.* 100 BC) (see Matthews 1990/1994).

The full story of 'grammar' would take too long to tell, but in its Latin guise it was the bedrock of Western schooling until the secularisation of education in the eighteenth-century Enlightenment encouraged the creation of vernacular grammars, providing for the needs of an increasingly literate society. Latin grammars had been designed to teach the subject as a foreign language and they therefore adopted a highly normative approach. The unthinking transfer of this prescriptivism to the teaching of the mother tongue resulted in a species of simplistic, Latin-based 'school grammars', which tended to tarnish the reputation of traditional grammar as a whole.

The need to improve language pedagogy was one motivation for the reorientation of linguistic studies in Europe in the early nineteenth century, but so too was the renewal of contact with other traditions, most importantly that of the **Sanskrit** scholars whose objectivity and sharpness of focus on the linguistic (rather than literary) aspects of the subject seemed to accord with contemporary intellectual trends influenced by the methods and procedures of the natural sciences. The example of the Swedish botanist **Carl Linnaeus** (1707–78) in classifying the plant world had greatly impressed the eighteenth century, and geology was another science that seemed to offer language an appropriate model, particularly as it had a historical dimension that suited the intellectual climate of the time (e.g., Whitney 1875: 195). In fact the nineteenth century represented a synthesis between a sober demand for meticulous scientific research and a romantic desire to 'return to national roots' fired by revolutions in America and France and by

the disintegration of the classical tradition in the arts and sciences.

A commitment to rigour was at the heart of the new linguistic sciences, including the close observation and careful collection of the 'facts', meticulous record-keeping and the exercise of objective judgement in the processes of classification, accountability to the wider scientific community through the dissemination of findings, etc. More significant, however, was the intellectual conviction that language was subject to the kind of 'general laws' that were the hallmark of the natural sciences. Arguments such as these increased as the young science (still known as 'philology' – 'linguistics' came later) moved decisively into comparative studies from the early 1820s onwards, applying notions such as sound change in the investigation of, for example, 'language families', a line of research influenced by the interest in the biological sciences kindled *inter alia* by the appearance of Charles Darwin's *The Origin of Species* in 1859.

Then quite suddenly in the 1870s the argument turned much sharper. A group of young German scholars in Leipzig – the so-called **Junggrammatiker** (**Neogrammarians**, initially a term of abuse) – challenged the contemporary establishment by announcing that their scientific claims convinced nobody. In particular, the sound-change laws were not scientific in any serious sense unless they aimed at generalisations that were watertight and exceptionless. In addition, linguistic evidence should be derived from spoken language sources, not merely written inscriptions, and suitable informants could be found among the speakers of non-standard dialects whose speech had not been 'corrupted' by education in the standard language. There was a hint of romanticism in this suggestion, but it was also noted positively by **Ferdinand de Saussure** (1857–1913), a young student at Leipzig at the height of the Junggrammatiker furore, and repeated in the opening chapter of his posthumous ***Cours de linguistique générale*** (1916), namely that a language should not be seen 'as an organism developing of its own accord but … as a product of the collective mind of a linguistic community' (Saussure 1916/1983: 5).

In 1876, Saussure (who had moved into philological studies from physics and chemistry) was poised to become the most highly respected philological scholar of his time. In 1906–7, with a major academic career behind him and still only fifty years of age, he gave a series of lectures in his home university of Geneva, to which he had returned in 1891 after ten years as a professor in Paris. He repeated the course twice more, ending in 1911. In their eventual published form these lectures effectively transformed nineteenth-century **historical and comparative philology** into the twentieth-century discipline of contemporary linguistics. They were to be Saussure's last academic achievement – two years later he died of cancer aged fifty-six, leaving no manuscript or lecture notes. His Geneva colleagues and students collaborated in a complex editorial project to bring his work to the outside world with the publication of the *Cours* in Paris in 1916. Through this extraordinary chain of events, Saussure became known as the 'founding father' of modern linguistics. We shall look at his ideas again below.

Three phases of development in twentieth-century linguistics

Twentieth-century linguistics can be divided into two main phases: a phase of emergence lasting until the late 1920s or early 1930s, and a later phase of expansion and diversification triggered by the general expansion of higher education after 1960. Between them was a period of transition, which affected the subject differently in Europe and America (see Figure 1).

Phase 1: The emergence of modern linguistics (1911–33)

As we have seen, modern linguistics was founded by the leading philologist of his day towards the end of his academic career. Saussure was no young Turk setting out to break the mould; he was the recognised elder statesman whose greatness lay in his ability to identify and preserve what his profession had achieved in the nineteenth century while at the same time setting it on a completely new course for the future. He did not get everything right (perhaps this explains his decision to scrap his lecture notes), but after Saussure linguistics could never be the same. We shall look at his specific proposals later. First we need to summarise the basic

Phase 1: The emergence of modern linguistics (1911–33)

1911 Saussure's third (final) lecture series in Geneva
Boas's 'Introduction' to *Handbook of American Indian Languages*
1912 Daniel Jones becomes Head of Department of Phonetics, University of London
1913 Death of Saussure (1857–1913)
1914 Bloomfield's *Introduction to the Study of Language*
1916 Saussure's *Cours de linguistique générale*
1921 Sapir's *Language*
1924 Linguistic Society of America founded
1925 First volume of the journal, *Language*
1928 First International Congress of Linguists (The Hague)
1932 First International Congress of Phonetic Sciences (Amsterdam)
1933 Bloomfield's *Language*

Phase 2: A time of transition (c. 1925–60)

1923 Malinowski's 'The problem of meaning in primitive languages'
1926 Linguistic Circle of Prague founded
1938 Death of Trubetzkoy (1890–1938)
1939 Trubetzkoy's *Grundzüge der Phonologie*
Death of Sapir (1884–1939)
1941 Death of Whorf (1897–1941)
1942 Death of Boas (1858–1942)
1944 J.R. Firth becomes Professor of General Linguistics, University of London
1949 Death of Bloomfield (1887–1949)
1951 Harris's *Methods in Structural Linguistics*
1953 Weinreich's *Languages in Contact*
1956 Jakobson and Halle's *Fundamentals of Language*
1957 Chomsky's *Syntactic Structures*

Phase 3: The expansion and diversification of linguistics (since 1960)

1961 Halliday's 'Categories of the theory of grammar'
1963 Greenberg's *Universals of Language*
1965 Chomsky's *Aspects of the Theory of Syntax*
1966 Labov's *The Social Stratification of English in New York City*
1973 Halliday's *Explorations in the Functions of Language*
1978 Halliday's *Language as Social Semiotic*
1981 Chomsky's *Lectures on Government and Binding*
1985 Halliday's *Introduction to Functional Grammar*
1986 Chomsky's *Knowledge of Language*
1995 Chomsky's *The Minimalist Program*

Figure 1 Three phases of development in twentieth-century linguistics: a chronology.

principles behind his transformation of '**philology**' into '**linguistics**'.

Linguistics is the scientific study of language for its own sake.

The stress on science was not new, though its interpretation varied with time and context. What was important for Saussure was the focus on language for its own sake (philology never really gave up its links with the study of texts).

Linguistics is not prescriptive.

For Saussure, this was an obvious preliminary to a definition of linguistic science. It was perhaps

more central to American linguistics, with its more practical orientation.

Spoken language is the primary object of study.

The spoken language principle was already strongly held in phonetic and (some) philological circles, but Saussure's emphasis on it is quite explicit 'the spoken word alone constitutes [the object of study in linguistics]' (Saussure 1916/1983: 24). However, he was also prepared to be practical – written texts might be the only materials available.

Linguistics is an autonomous discipline.

As a new science, linguistics had to fight off the claims of other more powerful disciplines, such as psychology, philosophy and anthropology. The first principle (the study of language 'for its own sake') was very significant in this context – as was the last, the synchronic principle.

Synchronic studies of language at a specific point in time take precedence over diachronic (historical) studies.

For Saussure this was the principle that revolutionised linguistics – 'it is absolute and admits no compromise' (Saussure 1916/1983: 83). It was, so to speak, the Rubicon philology could not cross. It also opened the way to the central (structural) point of his theory; namely, that 'the linguist must take the study of linguistic structure as his primary concern, and relate all other manifestations of language to it' (Saussure 1916/1983: 9). We shall discuss what he meant by 'linguistic structure' later.

The beginnings of American linguistics

By a curious coincidence of timing modern linguistics can be said to have emerged in the same year on both sides of the Atlantic. The year 1911 was not only the year of Saussure's final lecture series at Geneva; it was also the year in which the first part of the official *Handbook of American Indian Languages* was published in Washington. The Introduction by **Franz Boas** (1858–1942) came to be seen as a major milestone for the subject in the USA.

Unlike European linguistics, with its emphasis on theory, American priorities were firmly practical. The Amerindian project was a large-scale study designed to cover the whole field before too many of the languages involved became extinct, and it was led by an anthropologist who could claim expertise in the new linguistic sciences. The basic message of his famous Introduction was: respect for the data and the generalisations that could be drawn from it, provided the proper procedures were followed in a disciplined manner.

The project became a kind of rite of passage for all the major linguists of the time, and it also provided a clear perimeter fence that distinguished the **linguist** from the **philologist** – though there were significant individuals such as **Leonard Bloomfield** (1887–1949) who were equally at home in both environments. In his first book (Bloomfield 1914), published after a study visit to Germany, his philological interests were still strong, though he called his subject 'linguistics', a term which (following Whitney 1875) the Americans (unlike the British; cf. Bolling 1929) accepted without difficulty. Although Boas and Bloomfield published their early work before Saussure, their general approach, following consciously in the footsteps of Whitney (1867, 1875), was consistent with the five principles listed above. In the context of the autonomy issue, Bloomfield's prefatory note is particularly instructive: 'I hope that this essay may help to introduce students of philosophy, psychology, ethnology, philology and other related subjects to a juster acquaintance with matters of language' (Bloomfield 1914/1983: vi).

The other young scholar of importance in America was **Edward Sapir** (1884–1939) who, like Boas, was an anthropologist with a consuming interest in language. In *Language*, published in 1921 and written in typically elegant prose, Sapir made the most extensive statement yet on the new approach to language study, introducing for the first time notions such as the significance of formal linguistic patterning which were to become increasingly influential. He also emphasised the independence of form and function: 'we cannot but conclude that linguistic form may and should be studied as types of patterning, apart from the associated functions' (Sapir 1921: 60).

Soon there were the first signs of successful institutionalisation. The Linguistic Society of America (LSA) was inaugurated in December

1924, with its 'house journal' *Language* appearing the following year (though it was a long time before articles on linguistics formed more than a minority of the contents [Matthews 1993: 10–11]). Back in Europe, a group of followers of Saussure established the Prague Linguistic Circle in 1926, the membership of which eventually included major figures in the subsequent history of the subject: Roman Jakobson, for instance, and Prince Nikolai Trubetzkoy. In 1928 the first International Congress of Linguists was held in The Hague, and the first in the Phonetic Sciences in Amsterdam in 1932. Finally, with the appearance of Bloomfield's massive second book, also called *Language* (1933), there could no longer be any doubt: linguistics had arrived, though it comes as a bit of a shock to note that, among the 264 founder members of the LSA in 1924, only two could claim to hold an academic post explicitly linked to the subject (one being Bloomfield).

Before moving to Phase 2, we should take a brief look at linguistics in Britain. For centuries the English have always been good at the same two linguistic things: phonetics and lexicography, and both were riding high in the late nineteenth century. It was not difficult, for instance, to claim scientific status for **phonetics** and it also had considerable potential for practical application: in language pedagogy, for instance, medicine, or the new technology of sound recording (Thomas Edison's phonograph appeared in 1877). **Lexicography** benefited from the nineteenth-century obsession with history, which provided the basis for the huge project that dominated England as the American Indian project dominated America; namely the *Oxford English Dictionary*. While phonetics counted as part of linguistics in the broad sense, the dictionary project is much more doubtful. It was essentially an exercise in philology. Where the new linguistic sciences had some influence was in the interest in **dialectology**, which was given plenty of houseroom in the *Transactions of the Philological Society* from the 1840s onwards. But there was no British equivalent of W.D. Whitney to lead the transition from **philology** to modern **linguistics**. The leadership role in England fell to **phonetics** (see Firth 1946/1957a) and therefore to **Henry Sweet** (1845–1912) – the man who 'taught phonetics to Europe' (Onions 1921: 519), but who was also very protective of traditional philological studies in which he had a formidable (and enduring) reputation. He passed the phonetics torch to **Daniel Jones** (1881–1967) and the subject was accorded the status of an academic department at London University as early as 1912. By 1921 there was a Chair, with Jones as the obvious appointee; general linguistics had to wait another twenty-three years for a similar honour.

The history of the term, '**linguistics**', in Britain is instructive in this context. Sweet avoided it, preferring his homemade term '**living philology**' (e.g., Sweet 1884: 593, 1899: 1). Jones had little need for it, since most of his work was closely tied to phonetic data, and general 'linguistic' matters were not seen as pressing, though his language teaching colleague Harold Palmer used it as the title of a course he gave at the School of Oriental Studies (Smith 1999: 62). Oxbridge preferred not to recognise its existence at all: C.K. Ogden, for instance, possibly the nearest Oxbridge had to a linguist before 1945, only used the word in *The Meaning of Meaning* (with I.A. Richards, 1923) when translating from other languages (even using 'linguistic' as a noun on two occasions) or when introducing Malinowski, who contributed a famous Supplement. Bolling tells us that the British establishment tried (unsuccessfully) to persuade the Americans that 'philology' was the right label (Bolling 1929). Whitney's early groundwork in the USA had borne fruit.

Phase 2: A time of transition (c. 1925–60)

Modern linguistics emerged at much the same time in Europe and the USA, and the post-war revival started around 1960 for both, but the intervening years were very different in the two continents. In America, structural linguistics, or descriptive linguistics as it came to be known, grew in size and extent throughout the inter-war period until it suddenly and unexpectedly lost its leadership in the 1940s, initiating a period of transition before Chomsky's 'generative enterprise' took centre stage in the 1960s. Saussurean linguistics, on the other hand, had no leader and change began as soon as the ideas had been assimilated in Europe after the First World War.

As it stood, Saussure's *Cours* had little to say about the practical description of particular

languages, and it was partly to fill this gap that the **Linguistic Circle of Prague** was founded in 1926. Phonology was the first – but not the only – focus of the Circle's work, which rapidly developed a personality of its own, adopting a strongly functional interpretation of linguistics. **Functionalism** was also the mark of André Martinet in Paris in the late 1930s before internment during the war and ten years in America, and, in a rather different sense, function was a central component of Louis Hjelmslev's theory of **glossematics** published in Copenhagen in 1943, though it was little known until an English translation appeared in 1953. Finally, there was London, where linguistics (as distinct from phonetics) began in a small way with a contribution by the anthropologist Bronislaw Malinowski in 1923. Although superficially reminiscent of the role of Boas and Sapir in America, Malinowski's work led the subject in an entirely different direction – away from the structural properties of sentences and their parts, and towards the functional values of texts (especially spoken texts) and their role in social life. London under J.R. Firth in the 1940s and 1950s effected a new synthesis that combined the 'micro' traditions of English phonetics/phonology with the textual traditions of Malinowski and later also Prague, within Malinowski's anthropological framework known as 'the context of situation'. It might have been a rather mixed assortment, but under the influence of Firth's student, M.A.K. Halliday, it was forged into a powerful model that genuinely sought to establish a fertile union between form and function within a general theory of language in a social context ('social semiotic', to use Halliday's phrase [1978]). With Halliday, the long transition from Saussurean structuralism was complete.

The American story is more traumatic. After a long period of growth between the wars, structural-descriptive linguistics was deprived of all its leading founder members within a few years. Sapir died from a heart condition in 1939 aged fifty-five; Whorf from cancer in 1941 aged only forty-four; Boas in 1942 (he was already an elderly man); and Bloomfield himself through a stroke, which effectively removed him from the profession in 1947 at the age of sixty (he died in 1949). The next generation, delayed somewhat by the war anyway, was not ready to take over, and Bloomfield's colleagues and followers, who had not expected the role of leadership to be thrust upon them, understandably held back from any overt move to step into his shoes. Under such circumstances, new initiatives were bound to come from the edges rather than the mainstream, and one of the successful new departures of the 1950s was **applied linguistics** in both language pedagogy (Charles C. Fries) and mission work (e.g., Eugene Nida and Kenneth Pike of the **Summer Institutes**).

The linguists left behind in 1950 (Bernard Bloch, for instance, George L. Trager, Charles F. Hockett and Zellig S. Harris) have since become known collectively as '**post-Bloomfieldians**' in acknowledgement of their decision to carry on with the work Bloomfield had initiated, but the practical effect (see Matthews 1993 for details) was inevitably to extend the technicalities of structural analysis rather than rethink the approach. However, Harris, in some ways the most influential of the group, produced the idea that brought this unsought-for and somewhat unhappy transitional interlude to an end: **transformational grammar**. By the 1960s, in the hands of Harris's former student Noam Chomsky, it had become **transformational-generative grammar** (**TG**) and was well on the way to recreating the energies of the inter-war years.

Phase 3: the expansion and diversification of linguistics (since 1960)

From around 1960, linguistics in both Europe and the USA began to benefit from the expansion of higher education following the post-war economic recovery: new departments were opened, research programmes initiated, posts created, and so on. It was a lively time, and the subject itself attracted a large number of young people, including those at the top with the new ideas – scholars like Noam Chomsky in the USA and M.A.K. Halliday in Britain (later Australia).

The chronology in Figure 1 offers only a short list of texts under the present heading, but this does not reflect a lack of activity (rather, the reverse). So much was being done that only a very few publications stood out as marking a major new departure. In addition, all the important works since 1960 are listed under individual entries elsewhere in this encyclopedia.

The unifying theme of structuralism which had maintained a broad transatlantic consensus before the war evaporated fast in the early 1960s, and by 1970 it had vanished, leaving two contrasting approaches to the subject, both descended from different branches of the structuralist 'family tree'. One (Chomskyan generativism) was fathered directly by American structuralism, and the other (functionalism) had more complex parental origins, but there was no doubt that the line went back to Saussure in the end.

The details of this contrast will emerge later, but some of the key features can be sketched quickly here. Generativism typically idealises the data and employs it in the pursuit of an increasingly powerful theory of language acquisition and its role in understanding the human mind. There is no interest in the 'real world' here; language is the realm of (largely silent) cognition. For many people, however, this is a world of great allure that affords the kind of excitement that 'frontiers of knowledge' have always generated. The functionalist alternative refuses to idealise language; it is located in a world of real events affecting the lives of everybody in one way or another. This has a special attraction for those who are concerned to understand, and perhaps influence – even control – the power that language has in the conduct of everyday life. It is an approach that places a high value on respect for authentic language data and in recent years it has been able to match the technological gloss that used to be a generativist preserve by developing massive computer-based corpora on the basis of which to judge the status of linguistic generalisations. The functionalists use words like 'scientific', individual' and 'cognitive' less often than their generativist rivals, and words like 'human', 'social' and 'relationship' more frequently. For the time being, we must accept that there is no easy way in which the two approaches can be effectively unified into an integrated model, but eventually a synthesis will emerge since both sets of perceptions inhabit the same world.

Rivalries between approaches should not be allowed to mask the fact that modern linguistics is not defined solely by its 'mainstreams' but also by its breadth of coverage. Three initiatives, also dating from the 1960s, deserve particular prominence (and are dealt with in their own right in the encyclopedia) but there are, no doubt, many more.

The **descriptivist tradition** – the respect for language diversity, the meticulous collection and classification of appropriate data, and the commitment to language in the real world – lost its mainstream status in the 1960s, but it lived on, for instance, in the research, associated with figures like Joseph Greenberg (e.g., Greenberg 1963), that focuses on patterns of similarity among apparently diverse languages, associations in the data that would lend support to a theory of universals, not in the sense that 'all languages have such-and-such-a-feature', but that the spread of variation is narrower than it may appear to be. Greenberg's results continue to excite useful controversy.

A second major development in America was a direct challenge to the emergence of mainstream generativism. Known from the 1950s as **sociolinguistics**, it gathered considerable momentum in the 1960s, building to some extent on the past work of Sapir and Uriel Weinreich (1953), but also introducing a wholly new range of concerns into modern linguistic studies: the processes of language change, for instance, and language variation have been important themes, along with the linguistic consequences of human communication. It is impossible to identify specific 'leaders', but important contributors would have to include William Labov, John Gumperz, Dell Hymes and Joshua Fishman.

If sociolinguistics can be said to enrich the appeal of functionalism over its generativist rival, then by the same token modern **psycholinguistics**, the third major development of post-1960 linguistics, might be seen as an elaboration of aspects of generativism which focus on relationships between language and the human mind lying outside the domain of most functionalist analyses. While we should not press symmetries of this kind too far, they help to illuminate the contrasts they relate to. For instance, in its earlier behaviourist guise in the 1930s and 1940s, psycholinguistics, using the more tentative label of 'linguistic psychology', underpinned Bloomfieldian structuralism (Bloomfield 1935: 32) while, in its later cognitive manifestation, it became so enmeshed with the theoretical concerns of generativism that Chomsky famously defined linguistics itself as 'a subfield' of cognitive

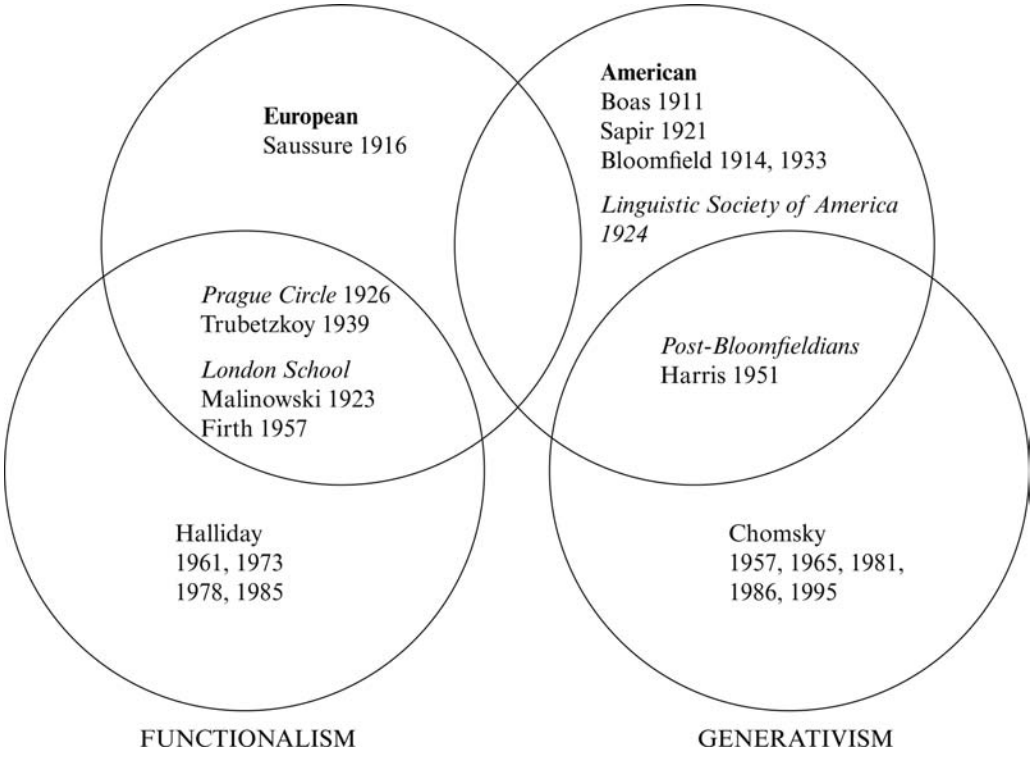

Figure 2 Trends in modern linguistics: a 'map of the world'.

psychology (e.g., Chomsky 1991: 5). In fact, for many of its adherents, the principal attraction of modern psycholinguistics lies in its links with the new cognitive sciences.

Trends in modern linguistics: a 'map of the world'

Figure 2 shows the three 'mainstream' approaches to linguistics in the twentieth century that have emerged from our discussion so far: structuralism, functionalism and generativism. However, it does not show instances of what might be called 'crossover' relationships, nor does it include sub-disciplines such as sociolinguistics or psycholinguistics despite the links with mainstream ideas that we have just noted above. Before continuing with the main text a brief comment on these omissions might be helpful.

First, as we shall see, functionalism and generativism represent such different perceptions of the linguistic world that 'crossover concepts' are rare. One well-known example, however, might be the notion of 'communicative competence' which, in the sense of this rather over-worked term identified by Hymes (1972), would qualify as an attempt to draw on ideas originating in both schools of thought.

Second, so far as sociolinguistics and psycholinguistics are concerned, their acceptance as unified subject matters is reflected in the use of one-word labels (even the earlier hyphens *socio-* and *psycho-*have disappeared). However, when these expressions are 'opened up' so to speak, their surface symmetry dissolves altogether. The infinitely diverse nature of 'language in use' as the raw material of sociolinguistics for instance has resulted in an umbrella term covering a wide variety of largely independent fields of investigation typically referred to by descriptive phrases such as *text linguistics*, *discourse analysis*, *conversation analysis*, *speech-act theory*, *genre analysis* and so on. Psycholinguistics by contrast has remained a more conceptually unified and sharply focused

field of enquiry into a subject that is deemed to have universal status, namely the workings of language in 'the human mind/brain'. While this topic, like any other complex subject matter, can be broken down into interrelated components, it remains a unitary study that does not encourage 'loose affiliations'. These contrasting approaches are reflected in the design of the present volume.

Structuralism

Structuralism in linguistics has two interpretations: one derived from Saussure, and the other from the American school founded by Boas.

The Saussurean model

In his *Cours de linguistique générale* Saussure famously compared language to chess, pointing out that the design of the pieces and their names are structurally irrelevant: they can take any form agreed between the participants provided only that each side starts with sixteen pieces divided into six contrasting categories, with the correct number of units in each category. The game may then proceed according to a system of agreed rules known to each player. This analogy demonstrates clearly the distinction between the surface phenomenon of 'a game' and the underlying system of categories and the rules for their deployment which together constitute 'chess'. Perhaps the most important point Saussure wanted to make is that each component of the system is defined by reference to its distinctive place in the system: change one element and the entire system is affected. Removing the bishop, for instance, would destroy 'chess', but a different game might emerge if the new bishopless system were agreed by all participants. Similarly, language is an arbitrary system of rules and categories that works by virtue of a 'social contract' tacitly accepted by all speakers, a socially sustained agreement to call a rose 'a rose'.

Given the chess analogy, we can understand why Saussure's first step towards a theory of language is to draw a basic distinction between instances of language in use (*parole*) and the underlying language system (*langue*) (the French terms have no exact equivalents in English and typically remain untranslated in accounts of Saussure's work). Linguistic structure lies at the heart of *langue* and is the primary concern of linguistics (cf. Saussure 1916/1974/1983: chapter 3).

Saussure goes on to characterise langue as a 'social fact', that is a socially sanctioned system of signs each of which represents a conventionalised ('arbitrary') fusion of sound (the **signifier**) and meaning (the **signified**). Since the significance of a sign derives from its relationships with other signs in the system, it has no meaning 'on its own'. The meaning of the signifier *house* in English, for instance, is that it contrasts with *flat*, *tower block*, etc., and each language determines its system of contrasts in a different way. The same is true *mutatis mutandis* for sounds: /p/ is a significant sound in English because it contrasts with /b/, /f/, etc. What is important is the total system, not the component 'bits'.

Langue is not, however, merely a bundle of signs; it is a structured system of relations organised in terms of two contrasting axes. The first is a 'horizontal' (**syntagmatic**) axis along which signs are combined into sequences. Saussure declined to call these sequences 'sentences', since for him a sentence was an instance of parole (a unit that would probably be called an 'utterance' today). In addition, each point in the sequence represents a (more or less tightly constrained) choice of alternatives on a 'vertical' ('**associative**') axis. This two-dimensional framework became a central feature of structural linguistics (with '**paradigmatic**' replacing the term 'associative').

The final point of importance in this thumbnail sketch of a complex work is Saussure's emphatic rejection of the notion that language is a nomenclature, i.e. a set of labels for pre-existing categories 'in the real world'. Quite the opposite – linguistic systems impose their structures on the world and each language 'sees the outside world' in a unique way. This does not mean that speakers are 'prisoners' of their linguistic categories, but it does mean that all languages are different (a cardinal principle of structuralism) and a special effort is needed to understand the categories of a new one. The *Cours* itself provides an excellent example in the resistance of *langue* and *parole* to translation into English.

The lack of a translation for many years meant that the reception of Saussure's work in the anglophone world was rather slow, though Bloomfield himself was an early reviewer in

America (Bloomfield 1923), acknowledging that Saussure had 'given us the theoretical basis for a science of human speech', but noting also that he differed from Saussure 'chiefly in basing my analysis on the sentence rather than on the word' (Bloomfield 1923: 319). This was to become a major point of difference between Saussurean and American linguistics, including Chomsky's (1964: 23ff.).

American structuralism

In writing his Introduction to the ***Handbook of American Indian Languages***, **Franz Boas** aimed to produce a scientific study as free from prejudice and preconception as possible and dedicated to an objective and positive approach to the practical work in hand.

Being an anthropologist, Boas began with a warning against simplistic notions purporting to link language, race and culture, each of which must be studied independently before connections are proposed. From there he turned to language and the first instance of the most emblematic of structuralist themes: respect the data and let it speak for itself. He answered the contemporary prejudice that 'primitive peoples don't pronounce accurately' by pointing out that listeners impose their own sound system on others and then complain they cannot understand. The first task of linguistics was to provide objectively accurate phonetic descriptions on the principle that 'every single language has a definite and limited group of sounds' (1911: 12). Later this was to become **the phoneme principle**.

Other basic principles included:

- All languages are different: 'in a discussion of the characteristics of various languages, different fundamental categories will be found' (Boas 1911: 39). Boas provides a memorable set of examples which must have come as a shock to readers used only to the predictabilities of a few Indo-European languages.
- 'Give each language its proper place' (Boas 1911: 39), i.e. do not impose preconceived categories on the data – including categories derived from other Indian languages.
- The sentence is the basic unit of language: 'since all speech is intended to serve for the communication of ideas, the natural unit of expression is the sentence' (Boas 1911: 23).

Already the positivist, data-led ground rules of American structuralism had been laid; much later Bloomfield picked up the same themes in a famous structuralist dictum, 'the only useful generalisations about language are inductive generalisations' (Bloomfield 1935: 20).

The next significant step came in **Sapir's *Language*** (1921), where for the first time the discussion is couched in structural terms and Sapir introduces the concept of formal patterning, a notion he went on to explore in more detail in his later work.

Sapir's (1921) wholly integrated approach to language, culture and social life was later somewhat modified by the ideas of Benjamin Lee Whorf (1897–1941) – in the so-called '**Sapir–Whorf Hypothesis**'. In an extreme form the hypothesis claimed that the human mind could not escape from the cognitive constraints of specific linguistic systems, but there were weaker and perhaps more convincing versions. What the idea really needed was a long-term research programme, but the early deaths of both Sapir (1939) and Whorf (1941) left a legacy of unfinished business (see Lee 1996 for a comment).

Finally came Bloomfield's ***Language*** (1933), probably the major classic of the period, yet difficult to assess because it plays more than one tune. As Matthews puts it: 'one of the marvellous things about Bloomfield's *Language* is the way in which it reconciled so much that was the established wisdom in the discipline … with so much that was strikingly new' (Matthews 1993: 11).

This was the book that taught linguistics to America. It marked a crucial watershed: before *Language*, linguistics might have been absorbed into traditional academia once the Amerindian project was completed; after it, however, this could not have happened. The subject had earned and deserved its autonomy.

Language is no descriptivist manual (Bloomfield wrote one later [see Bloomfield 1942]). It is a hugely well-informed and detailed account of the whole field of linguistics, traditional and modern, but it is better known now for what its later opponents have criticised rather than for what it set out to do in its own day. This is particularly true of its approach to **meaning**.

As is well known, Bloomfield accepted the arguments of behaviourism, including the principle that scientific enquiry required overt, observable evidence. This committed him to a situational theory of meaning ('we have defined the meaning of a linguistic form as the situation in which the speaker utters it and the response which it calls forth in the hearer' [Bloomfield 1935: 139]), which he illustrated in a lengthy anecdote about 'Jack and Jill' (1935: chapter 2). In summary form, Jack gets Jill an apple off a tree as the (apparent) consequence of Jill speaking to him (presumably she asked for it). This approach to meaning proved very influential in foreign-language pedagogy for a long time, but as a serious contribution to linguistic theory it will not do. Even in the – heavily manipulated – Jack and Jill story, which puts the situational approach in the best possible light, it is still impossible to know what Jill actually said. Bloomfield's need for scientific consistency had led him up an intellectual cul-de-sac, and he tried a different tack. This time he maintained that the only way of reaching a scientific definition of meaning was to obtain the relevant scientific knowledge (e.g., defining salt in terms of chemistry [Bloomfield 1935: 139]). Finally, he gave up – 'any utterance can be fully described in terms of lexical and grammatical forms; we must remember only that the meaning cannot be defined in terms of our science' (Bloomfield 1935: 167) – and continued with his book. Unfortunately, the long-term effect of this weakness made his followers nervous of the topic, encouraging the belief that meaning had to be 'kept out' of scientific linguistic procedures.

It is interesting to speculate whether Bloomfield would have modified his 'mechanistic' views on meaning if he had not died prematurely in 1949 (it is not impossible: he had changed his mind before). What happened in practice, however, was an even more determined effort by his successors (the 'post-Bloomfieldians') to extend the practical analytic procedures of descriptive linguistics (for details see Matthews 1993). Bloomfield's teachings stressed the importance of formal features and mechanical (i.e. 'objective') techniques. The outcome was an approach known as 'distributional analysis', in which categories were established by systematically testing the data in all possible structural environments (its distribution) through techniques like substitution. Using meaning and 'mixing levels of analysis' were forbidden. This 'bottom-up' approach had its strengths, but eventually it could go no further. Higher-level grammatical units could never be 'discovered' in this way, as the post-war generation (particularly Noam Chomsky, b. 1928) argued.

Generativism

Generativism is associated so closely with **Noam Chomsky** that it is often referred to (despite his disapproval) as '**the Chomskyan revolution**'. However, as Lyons (1991: 162 ff.) and others have stressed, it is important to draw a distinction between transformational-generative grammar and the broader views and beliefs that characterise the so-called 'generative enterprise'. Acceptance of the former does not necessarily entail commitment to the latter.

Transformational grammar (TG) first emerged in the early 1950s in the work of the leading 'post-Bloomfieldian', Zellig S. Harris, Chomsky's supervisor at Pennsylvania, and was the central focus of his Ph.D. (1955), entitled 'Transformational Analysis'. The basic notion was that sentence types, e.g., actives and passives, were systematically related to each other. This was a commonplace of traditional grammar but rejected by structuralism because of the dependence on meaning. From these beginnings Chomsky devised a theory of so-called **kernel sentences** (sentences without transformations [active, declarative, etc.]), which could be described in terms of a set of **phrase-structure rules**, plus a set of **transformation rules**, in order to '**generate**' – i.e. provide structural descriptions for – the non-kernel derivatives (passive, interrogative, etc.). This model was the basis for his first major publication, ***Syntactic Structures*** (1957).

Chomsky's revival of the concept of rules was predictably controversial. In their attack on traditional grammar, the structuralists had made a special point of replacing 'rules' with 'patterns' and 'structures' that emerged from close involvement with the data. The term 'rules' may have reminded people of old school grammars, but there is nothing prescriptive about saying, for instance, that sentences in English consist of a

noun phrase followed by a verb phrase (e.g., *the dog* followed by *chased the cat*). The rule, which Chomsky formalised to look something like S → NP VP, is in effect a theory of English sentence structure which can be challenged empirically. More generally, Chomsky maintained that scientific linguistics had to start from theory, like any other science and the procedures for handling data offered by the structuralists would not do. Nor were these procedures as modestly practical as they appeared to be. Their ultimate aim was to 'discover' the grammar of the language under analysis – an aim which Chomsky dismissed as an impossible dream. Linguistic theory in his view should adopt a more limited and conventional goal; namely, to provide ways of choosing between alternative descriptions (e.g., between three possible candidate analyses of our example sentence: *the dog/chased the cat* or *the dog chased/the cat* or *the dog/chased/the cat*).

In 1957, Chomsky's linguistic and psychological views were kept separate, but in 1959 there was more than a hint of what was to come when he published a fiercely hostile review of *Verbal Behavior* by the leading behaviourist psychologist of the day B.F. Skinner, the subtext of which was a further criticism of the methods and procedures of structural linguistics which, as we have seen, had been heavily influenced by behaviourist thinking – particularly in the crucial area of meaning.

In 1965 Chomsky dropped the 'kernel sentence' notion in a major reworking of his model, which introduced a revolutionary new concept to the theory of syntax: a distinction between underlying (**deep**) structure and **surface structure**, the two interrelated by **transformations**, allowing active and passive sentences, for example, to have the same deep structure but two different transformational histories producing two different surface structures. Published as *Aspects of the Theory of Syntax*, this became known as the **standard theory**. In practice, however, the model soon showed itself to be cumbersome and insufficiently sensitive to the needs of languages other than English. Chomsky and his colleagues made substantial revisions during the 1970s to create the **extended standard theory**. The old phrase-structure rules were largely replaced by a more flexible syntactic process known as **X-bar theory**. The deep/surface distinction was preserved along with transformations, but in a heavily modified form, and there were also new features, all tending towards greater simplicity. The revised model (called **Government and Binding** [**GB**], later **Principles and Parameters** [**P&P**]) appeared in 1981 and gave the whole 'generativist enterprise' a new lease of life. Since then there have been further simplifying changes resulting in **The Minimalist Program** of the 1990s.

Chomsky's work has always been motivated by a single goal: to explain human **language acquisition**. Many of the changes mentioned above were expressly designed to help account for the acquisition process by offering simpler procedures in tune with the innate capacities of the acquirer. The reintroduction of **innate ideas** has been Chomsky's most far-reaching and controversial proposition. The key notion is that human language acquisition cannot be explained by any theory of social learning. It is too powerful and universal for that: there are no exceptions and no unexplained failures. Chomsky's response has been to postulate the existence in each human of what he calls **universal grammar** (**UG**), a set of genetically determined principles that define the nature of language and determine the course of acquisition. It has nothing to do with the specifics of particular languages, which are acquired through contact with data in the environment.

The final outcome of the acquisition process is a system of (tacit) knowledge ('**competence**' is Chomsky's term) that can be put to use in social communication, private thought, expression, and so on, activities that Chomsky categorises as 'language **performance**'. The competence/performance distinction (first put forward in *Aspects* in 1965) is reminiscent of Saussure's **langue/parole** contrast, but the choice of terms is psychological, not linguistic. 'Competence' seems an odd synonym for 'knowledge' (Chomsky himself has agreed), but 'performance' is an effective label, though typically described in rather negative terms, as the source of memory limitations, distractions, shifts of attention and errors of various kinds that prevent the true reflection of underlying competence. Like langue for Saussure, competence is the ultimate focus of linguistic theory, which is defined by Chomsky in his most famous quotation as being 'concerned

primarily with an ideal speaker-listener, in a completely homogenous speech-community, who knows its language perfectly and is unaffected by [performance limitations]' (1965: 3). How the ideal speaker-listener interacts with the actual language acquirer has been at the heart of the Chomskyan research programme since 1965.

Functionalism

While generativism reformulated structuralism without changing fundamentals such as the centrality of the sentence, functionalism transformed it by restoring an aspect of linguistic organisation that had been set on one side by the emphasis on form. Form and function (in at least one of its many guises) have long been traditional partners in the business of accounting for language and its use, form being concerned with the establishment of categories and function with the relations between them. In an English sentence like *The cat caught the mouse*, for example, *the cat* and *the mouse* have the same form (noun phrases) – but different functions: *The cat* functions as the subject of the sentence and *the mouse* as the object of the verb. '**Function**' can be extended to cover notional distinctions: the cat, being animate, functions as the **agent** of the catching, while the mouse as the one affected by the catching functions as the '**patient**'.

Functionalism is, however, even broader than this and it can be said to have had two godparents, both European: (i) the **Linguistic Circle of Prague** (1926–39), including Vilém Mathesius (1882–1945), Roman Jakobson (1896–1982) and Prince Nikolai S. Trubetzkoy (1890–1938), and (ii) the linguists of the so-called '**London School**', beginning with Bronislaw Malinowski (1884–1942) in 1923.

The Linguistic Circle of Prague (1926–39)

The principal aim of the linguists of the Prague Circle was to explore Saussurean structuralism and make proposals for its extension. Their best-known work is Trubetzkoy's ***Grundzüge der Phonologie*** (*Principles of Phonology*), an account of phonology published posthumously in Prague through the good offices of Jakobson in 1939. Following Saussure, Trubetzkoy was the first to distinguish systematically between **phonetics** (parole) and **phonology** (langue), placing the distinction in a functional context: 'phonology of necessity is concerned with the linguistic function of the sounds of language, while phonetics deals with their phenomenalistic aspect without regard to function' (Trubetzkoy 1939/1969: 12), the best-known instance of this principle being the phoneme and its contrastive function in distinguishing between different words, e.g., *pin* and *tin* in English. The characterisation of the phoneme itself as a 'bundle of distinctive features' also derived from Prague and was taken to America by Jakobson in 1942 and incorporated in publications with Morris Halle and others, including *Fundamentals of Language* (1956).

At the other end of the scale so to speak was the functional approach to text introduced by Karl Bühler (a philosopher colleague of Trubetzkoy's at Vienna University), who proposed a threefold classification which distinguished between a central '**representational**' **function** concerned with the content of the text, together with a contrasting pair of functions: '**expressive**' relating to the speaker/writer and '**conative**' to the listener/reader. Bühler's was the first of many such schemes which later influenced both Jakobson and Halliday. In the former case, Bühler's framework turned up in a much-extended form in Jakobson's famous contribution to a conference on stylistics in the late 1950s (Jakobson 1960).

Somewhere between the micro-functions of sentence components and the macro-functions of textual design, the Prague School (particularly Mathesius himself) founded an important line of research which came to be known as '**functional sentence perspective**' (**FSP**), aimed at identifying systematic relationships between linguistic units and features of text structure. It was specifically concerned with the way in which successive sentences in texts are constructed in order to reflect the developing pattern of information: what is '**new information**' (**rheme**) in one sentence, for instance, becomes '**given information**' (**theme**) in a later one and each language has its own way of signalling these relationships.

Functional linguistics in Britain

As we have already seen, the main British contribution to scientific language study focused on

phonetics, a success that was recognised institutionally at University College London (UCL) in 1912. The founding of the School of Oriental Studies (SOS) in 1916 expanded the range of expertise in the linguistic sciences considerably and it was intended that the School should do for the languages of the British Empire what the Americans were doing for Amerindian languages, and this was the case to some extent. In addition, Bronislaw Malinowski, an anthropologist with an interest in language from the London School of Economics, established a working relationship with J.R. Firth (1890–1960), a senior member of staff at the School from the late 1920s and (from 1944) the first Professor of General Linguistics in the UK.

Malinowski's work in the Trobriand Islands led him to develop a functional repertoire of text types, with special reference to spoken language in pre-literate societies (Malinowski 1923). His principal theoretical contribution to the subject was a notion that became closely associated with London linguistics: the context of situation, without knowledge of which he argued no coherent account of the meaning of spoken utterances was possible. In a detailed example based on a narrative describing the return home of a canoe, a key phrase literally translatable as 'we paddle in place' could only be understood properly as 'we arrived' if you knew that paddles replaced oars in the shallow water near the shore, i.e. the context of situation imposed a meaning on the text that in isolation it did not possess. For Malinowski – and for Firthians in general – this interdependence between contextual meaning and linguistic form was crucial.

Writing in 1950, Firth expanded the notion of 'context of situation' into a schematic construct, as he called it (Firth 1950/1957b), and one of the major themes that he drew from it was the importance of language variation in context, an idea that later became known as 'register'. In fact the investigation of 'meaning' in all its manifestations is at the heart of Firth's work, but it was only with Halliday (from 1961 onwards) that the crucial interrelationship between meaning and its linguistic realisation began to find a systematic foundation.

Halliday's contribution to late twentieth-century linguistics is immensely generous. His publications range over the entire field of language study from formal syntax to the teaching of reading in the most versatile display of talent and inspiration the subject has yet encountered. As a consequence, it is impossible to summarise his contribution with any justice, except perhaps to emphasise one or two major themes. The first is his insistence, following Firth, that language must be studied in an integrated, unified manner without the intervention of a **langue/parole distinction** (cf. Firth 1950/1957b: 180–1). Instead, linguistics must study language as 'part of the social process' (Firth 1950/1957b: 181) or as '**social semiotic**' (Halliday 1978). More specifically, the linguist must attempt to make explicit and systematic statements on the choices people make within the linguistic systems at their disposal ('**textual function**') in response to their social ('**interpersonal function**') and cognitive ('**ideational function**') needs. The three functions (or '**metafunctions**') provide the basic architecture of the approach within which the key concept is the network (or system) of choices. Taken together, these features explain the use of '**systemic-functional linguistics**' as the name for his approach.

As Halliday says in his *Introduction to Functional Grammar* (1985/1994: xvi–xvii), his early work concentrated on the importance of meaning in language, since he believed the current stress on formal syntax was undervaluing it, but later his emphasis shifted as he felt that the formal properties of language were being neglected in a rush for meaning. The interdependence between the two is the bedrock principle of his work. Of particular importance in this context is his joint publication with Hasan, *Cohesion in English* (1976), and his support for the tradition of discourse analysis associated with J.M. Sinclair and M. Coulthard. The details of functionalist linguistics are covered elsewhere in the encyclopedia.

Two macro-themes

Two themes have played a powerful role in the history of linguistics over the past 150 or so years. Both have to do with the implications of major methodological decisions and their theoretical implications.

The first of these themes relates to the imposition of a basic distinction between linguistic systems and language-in-use: Saussure's **langue/**

parole distinction is the original one, but Chomsky's **competence/performance** contrast is drawn in much the same place on the map. It could also be said that Bloomfeldian structuralism tacitly operated a **system/use distinction** in the search for 'patterns'. At the outset, it seems a convenient way of coping with the scope of the material, if nothing more. However, before long the theory-laden abstract 'sister' (langue, competence, system, etc.) has moved centre stage and her ordinary, everyday, 'real-world' sibling is marginalised. In 1875, Whitney said something rather powerful that may well still be relevant: 'not one item of any existing tongue is ever uttered except by the will of the utterer; not one is produced, not one that has been produced or acquired is changed, except by causes residing in the human will, consisting in human needs and preferences and economies' (Whitney 1875). Where has this gone? (cf. Joseph 1994).

Finally, it is appropriate to finish with a restatement of Saussure's basic aims for linguistics which reflect the second macro-theme of recent linguistic history: the contrast between **diversity** and **universality**. This was recognised by Sapir in 1921: 'There is no more striking general fact about language than its universality' and 'scarcely less impressive than the universality of speech is its almost incredible diversity' (1921: 22–3); and by Saussure in 1916, in a statement of basic aims which is out of date on specifics, but entirely relevant in its general thrust:

> The aims of linguistics will be:
>
> 1. to describe all known languages and record their history (this involves tracing the history of language families and, as far as possible, reconstructing the parent languages of each family);
> 2. to determine the forces operating permanently and universally in all languages, and to formulate general laws which account for all particular linguistic phenomena historically attested;
> 3. to delimit and define linguistics itself.
>
> (Saussure 1916/1983: 6)

A. P. R. H.

Suggestions for further reading

Joseph, J.E. (1994) 'Twentieth-Century Linguistics: Overview of Trends', in R.E. Asher (Editor-in-Chief), *The Encyclopedia of Language and Linguistics*, vol. IX, Oxford: Pergamon.

Matthews, P.H. (1993) *Grammatical Theory in the United States from Bloomfield to Chomsky* (Cambridge Studies in Linguistics, no. 67), Cambridge: Cambridge University Press.

Morpurgo Davies, A. (1998) *History of Linguistics*, Vol. IV, edited by G. Lepschy, London: Longman.

A

Acoustic phonetics

Acoustic phonetics deals with the properties of sound as represented in variations of air pressure. A sound, whether its source is articulation of a word or an exploding cannon ball, disturbs the surrounding air molecules at equilibrium, much as a shove by a person in a crowded bus disturbs the standing passengers. The sensation of these air pressure variations as picked up by our hearing mechanisms and decoded in the brain constitutes what we call **sound** [*see also* AUDITORY PHONETICS]. The question whether there was a sound when a tree fell in a jungle is therefore a moot one; there definitely were air-molecule variations generated by the fall of the tree but, unless there was an ear to register them, there was no sound.

The analogy between air molecules and bus passengers above is rather misleading, though, since the movements of the molecules are rapid and regular: rapid in the sense that they oscillate at the rate of hundreds and thousands of times per second, and regular in the sense that the oscillation takes the form of a swing or a pendulum. That is, a disturbed air molecule oscillates much as a pushed pendulum swings back and forth.

Let us now compare air molecules to a pendulum. Due to gravity, a pushed pendulum will stop after travelling a certain distance, depending on the force of the push; it will then begin to return to the original rest position, but, instead of stopping at this position, it will pass it to the opposite direction due to inertia; it will stop after travelling about the same distance as the initial displacement; it will again try to return to the initial rest position; but it will again pass this point to the other direction, etc., until the original energy completely dissipates and the pendulum comes to a full stop.

Imagine now that attached at the end of the pendulum is a pencil and that a strip of paper in contact with the pencil is being pulled at a uniform speed. One can imagine that the pendulum will draw a wavy line on the paper, a line that is very regular in its ups and downs. If we disregard for the moment the effect of gravity, each cycle, one complete back-and-forth movement of the pendulum, would be exactly the same as the next cycle. Now if we plot the position of the pendulum, the distance of displacement from the original rest position, against time, then we will have Figure 1, in which the y-ordinate represents the distance of displacement and the x-abscissa the time, both units representing arbitrary units. Since a wave form such as the one given in Figure 1 is generatable with the sine function in trigonometry, it is called a **sine wave** or a **sinusoidal wave**. Such a wave can tell us several things.

First, the shorter the duration of a cycle, the greater (the more frequent) the number of such cycles in a given unit of time. For example, a cycle having the duration of one hundredth of a second would have a frequency of 100 cycles per second (**cps**). This unit is now represented as **Hz** (named after a German physicist, Heinrich Hertz, 1857–94). A male speaking voice has on average 100–50 Hz, while a woman's voice is twice as high. The note A above middle C is fixed at 440 Hz.

Second, since the y-axis represents the distance of displacement of a pendulum from the

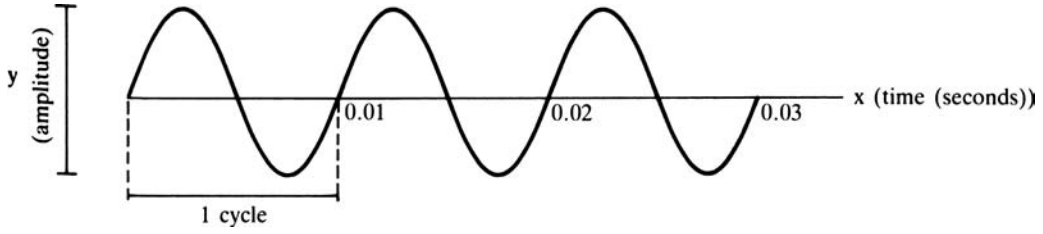

Figure 1 A sine wave whose cycle is one-hundredth of a second, thus having the frequency of 100 Hz.

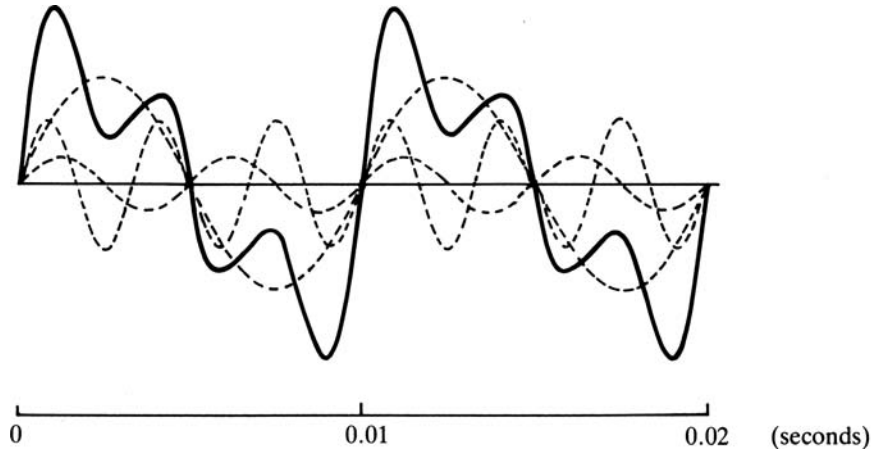

Figure 2 A complex wave formed with a combination of 100 Hz, 200 Hz and 300 Hz component waves.

rest position, the higher the peak of the wave, the greater the displacement. This is called **amplitude**, and translates into the degree of loudness of a sound. The unit here is **dB** (decibel, in honour of Alexander Graham Bell, 1847–1922). A normal conversation has a value of 50–60 dB, a whisper half this value, and rock music about twice the value (110–20 dB). However, since the dB scale is logarithmic, doubling a dB value represents sound intensity which is ten times greater.

In nature, sounds that generate sinusoidal waves are not common. Well-designed tuning forks, whistles, and sirens are some examples. Most sounds in nature have complex wave forms. This can be illustrated in the following way. Suppose that we add three waves together having the frequencies of 100 Hz, 200 Hz and 300 Hz, with the amplitude of *x*, *y* and *z*, respectively, as in Figure 2. What would be the resulting wave form? If we liken the situation to three people pushing a pendulum in the same direction, the first person pushing it with the force *z* at every beat, the second person with the force *y* at every second beat, and the third person with the force *x* at every third beat, then the position of the pendulum at any given moment would be equal to the displacement, which is the sum of the forces *x*, *y* and *z*. This is also what happens when the simultaneous wave forms having different frequencies and amplitudes are added together. In Figure 2, the dark unbroken line is the resulting complex wave.

Again, there are a few things to be noted here. First, note that the recurrence of the complex wave is at the same frequency as the highest common factor of the component frequencies, i.e. 100 Hz. This is called **fundamental frequency**. Note, second, that the frequencies of the component waves are whole-number multiples of the fundamental frequency. They are called **harmonics** or **overtones**. An **octave** is a relation between two harmonics whose frequencies are either twice or one half of the other.

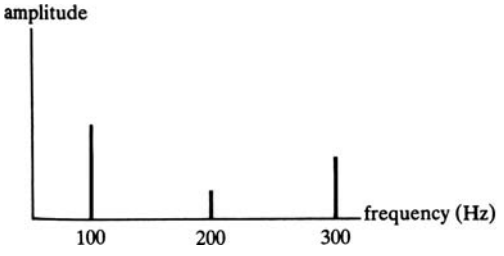

Figure 3 A line spectrum.

There is another way to represent the frequency and amplitude of the component waves, more succinct and legible than Figure 2; namely by transposing them into a graph as in Figure 3. Since the component waves are represented in terms of lines, a graph like Figure 3 is called **line spectrum**.

Recall that the frequencies of the component waves in Figure 2 are all whole-number multiples of the lowest frequency. What if the component waves do not have such a property; that is, what if the frequencies are closer to one another, say, 90 Hz, 100 Hz and 110 Hz? The complex wave that these component waves generate is shown in Figure 4.

Compared to Figure 2, the amplitude of the complex wave of Figure 4 decays rapidly. This is called **damping**. It turns out that the more the number of component waves whose frequencies are close to one another, the more rapid the rate of damping. Try now to represent such a wave in a line spectrum, a wave whose component waves have frequencies, say 91 Hz, 92 Hz, 93 Hz, etc. to 110 Hz. We can do this as in Figure 5.

What if we add more component waves between any two lines in Figure 5, say ten or twenty more? Try as we might by sharpening our pencils, it would be impossible to draw in all the components. It would be unnecessary also if we take the 'roof' formed by the lines as the envelope of the amplitude under which there is a component wave at that frequency with that amplitude, as in Figure 6. To contrast with the line spectrum in Figure 3, the spectrum in Figure 6b is called **envelope spectrum** or simply **spectrum**.

What is the significance of the difference in the two kinds of spectrum, Figure 3 and Figure 6b? It turns out that, if we divide sound into two kinds, **melody** and **noise**, melody has regular, recurrent wave forms, while noise has irregular non-recurrent wave forms.

Before turning to speech acoustics, it is worth noting that every object, when struck, vibrates at a certain 'built-in' frequency. This frequency, called **natural resonance frequency**, is dependent upon the object's size, density, material, etc. But in general, the larger the size, the lower the frequency (compare a tuba with a trumpet, a bass cello with a violin, or longer piano strings with shorter ones) and the more tense or compact the material, the higher the frequency (compare glass with carpet, and consider how one tunes a guitar or a violin).

Acoustics of speech

Vowels

A pair of vocal folds can be likened to a pair of hands or wood blocks clapping each other. As

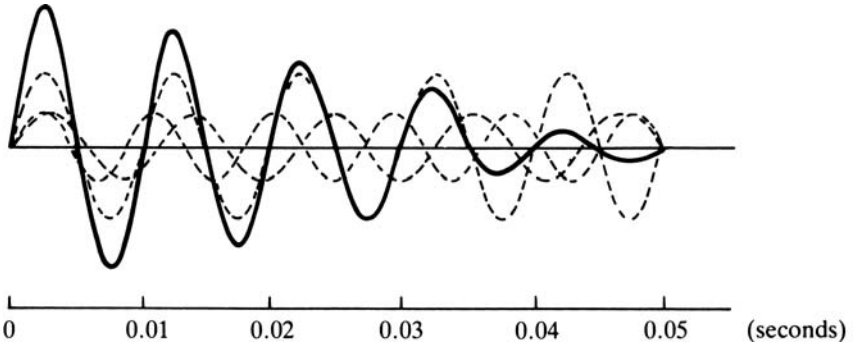

Figure 4 A 'decaying' complex wave formed with a combination of 90 Hz, 100 Hz and 110 Hz component waves.

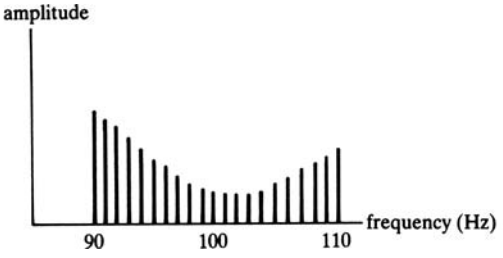

Figure 5 A line spectrum showing relative amplitudes and frequencies from 90, 91, 92 … to 110 Hz of the component waves.

such, the sound it generates is, strictly speaking, a noise. This noise, however, is modified as it travels through the pharyngeal and oral (sometimes nasal) cavities, much as the sound generated by a vibrating reed in an oboe or a clarinet is modified. Thus what comes out of the mouth is not the same as the pure unmodified vocal tone. And, to extend the analogy, just as the pitch of a wind instrument is regulated by changing the effective length or size of the resonating tube with various stops, the quality of sounds passing through the supraglottal cavities is regulated by changing the cavity sises with such 'stops' as the tongue, the velum and the lips. It is immediately obvious that one cannot articulate the vowels [i], [*a*] and [u] without varying the size of the oral cavity [*see also* ARTICULATORY PHONETICS]. What does this mean acoustically?

For the sake of illustration, let us assume that a tube consisting of the joined oral and pharyngeal cavities is a resonating acoustic tube, much like an organ pipe. The most uniform 'pipe' or tube one can assume is the one formed when producing the neutral vowel [ə] (see Figure 7).

Without going into much detail, the natural resonance frequency of such a tube can be calculated with the following formula:

$$f = (2n - 1)\frac{v}{4l}$$

where f = frequency, v = velocity of sound and l = length of the vocal tract.

Since v is 340 m per second, and l is 17 centimetres in an average male, f is about 500 Hz when n = 1, 1500 Hz when n = 2, 2500 Hz when n = 3, etc. What this means is that, given a vocal tract which is about 17 centimetres long, forming the most neutral tract shape usually assumed for the schwa vowel [ə], the **white noise** (the vocal-fold excitation) at one end will be modified in such a way that there will be resonance peaks at every 1000 Hz, beginning at

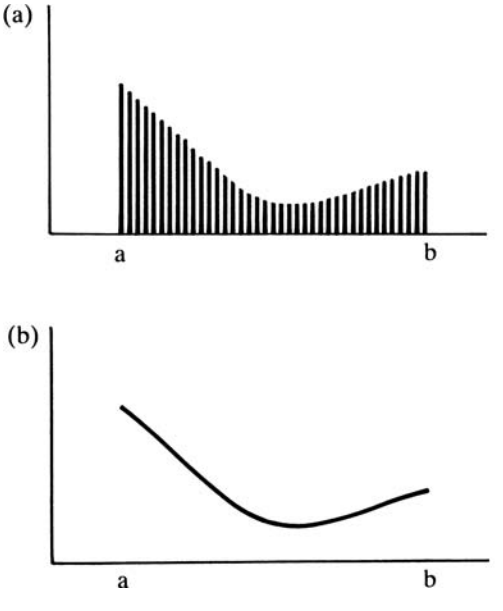

Figure 6 (a) A line spectrum with an infinite number of component waves whose frequencies range from a to b. (b) An envelope spectrum which is an equivalent of the line spectrum in Figure 6a.

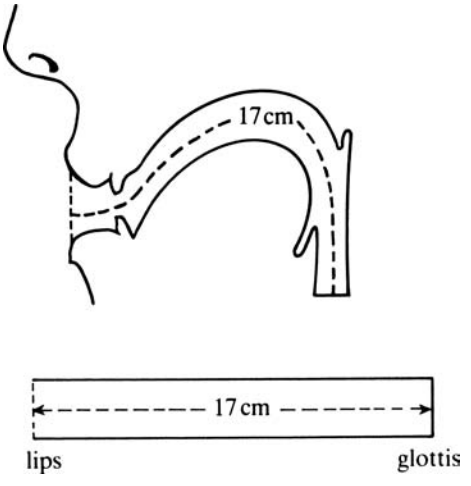

Figure 7 The vocal-tract shape and an idealised tube model of the tract for the most neutral vowel.

500 Hz. These resonance peaks are called **formants**.

It is easy to imagine that a change in the size and shape of a resonating acoustic tube results in the change of resonance frequencies of the tube. For the purpose of speech acoustics, it is convenient to regard the vocal tract as consisting of two connected tubes, one front and the other back, with the velic area as the joint. Viewed in this way, vowel [i] has the narrow front (oral) tube and the wide back tube, while [a] is its mirror image, i.e. [a] has the wide front tube but the narrow back tube. On the other hand, [u] has the narrow area ('the bottle neck') in the middle (at the joint) and, with lip rounding, at the very front as well. The vocal-tract shapes, the idealised tube shapes and the resulting acoustic spectrum of these three vowels are as illustrated in Figure 8.

The formant frequencies of all other vowels would fall somewhere between or inside an approximate triangle formed by the three 'extreme' vowels. The frequencies of the first three formants of eight American English vowels are given in Table 1.

Table 1 can be graphically represented as Figure 9 (adapted from Ladefoged 2006: 185).

A few things may be observed from this figure:

- Fl rises progressively from [i] to [a], then drops to [u].
- F2 decreases progressively from [i] to [u].
- In general, F3 hovers around 2500 Hz.

From this it is tempting to speculate that F1 is inversely correlated with the tongue height, or the size of the oral cavity, and that F2 is correlated with the tongue advancement, or the size

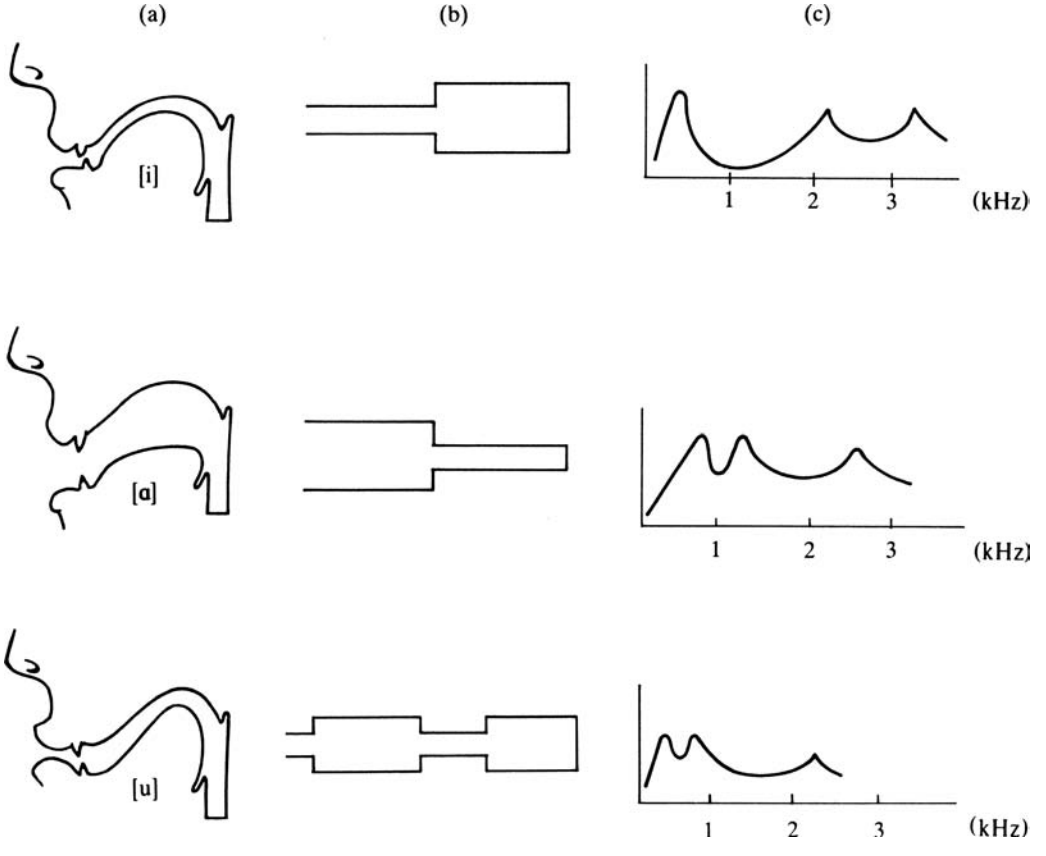

Figure 8 The vocal-tract shapes (a), their idealised tube shapes (b), and the spectra (c) of the three vowels [i], [ɑ] and [u].

Table 1 The frequencies of the first three formants in eight American English vowels

	[i]	[ɪ]	[ɛ]	[æ]	[ɑ]	[ɔ]	[ʊ]	[u]
Fl	280	400	550	690	710	590	450	310
F2	2250	1920	1770	1660	1100	880	1030	870
F3	2890	2560	2490	2490	2540	2540	2380	2250

of the pharyngeal cavity. While this is roughly true, Ladefoged feels that there is a better correlation between the degree of backness and the distance between the first two formants (i.e. F2–F1), since in this way there is a better match between the traditional articulatory vowel chart and the formant chart with F1 plotted against F2, as shown in Figure 10 (from Ladefoged 2006: 183).

Consonants

The acoustics of consonants is much more complicated than that of vowels, and here one can talk only in terms of generalities.

It is customary to divide consonants into **sonorants** (nasals, liquids, glides) and **obstruents** (plosives, fricatives, affricates). The former are characterised by vowel-like acoustic qualities by virtue of the fact that they have an unbroken and fairly unconstricted resonating tube. The vocal tract for nasals, for example, can be schematically represented as a reversed letter F, shown in Figure 11.

The open nasal tract, functioning as a resonating acoustic tube, generates its own resonance frequencies, known as **nasal formants**, which are in general discontinuous with vowel formants. Different lengths of the middle tube, i.e. the oral tract, would be responsible for different nasals.

The acoustic structure of **obstruents** is radically different, for obstruents are characterised by either the complete obstruction of the airflow in the vocal tract or a narrow constriction impeding the airflow. The former creates a silence and the latter a turbulent airstream (a hissing noise). Silence means no sound. Then how is silence heard at all and, furthermore, how are different silences, e.g., [p], [t], [k], distinguished from each other? The answer is that silence is heard and distinguished by its effect on the adjacent vowel, as illustrated in the following.

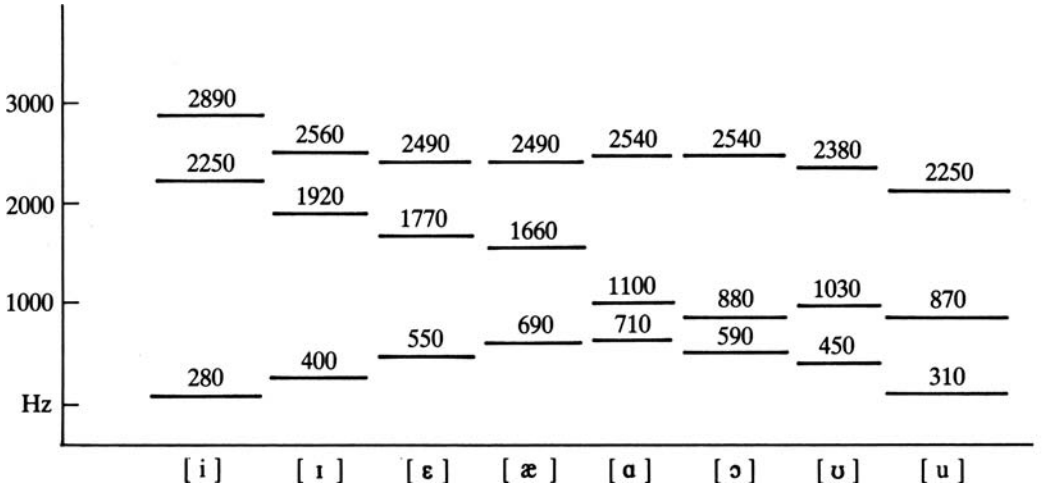

Figure 9 The frequencies of the first three formants in eight American English vowels.

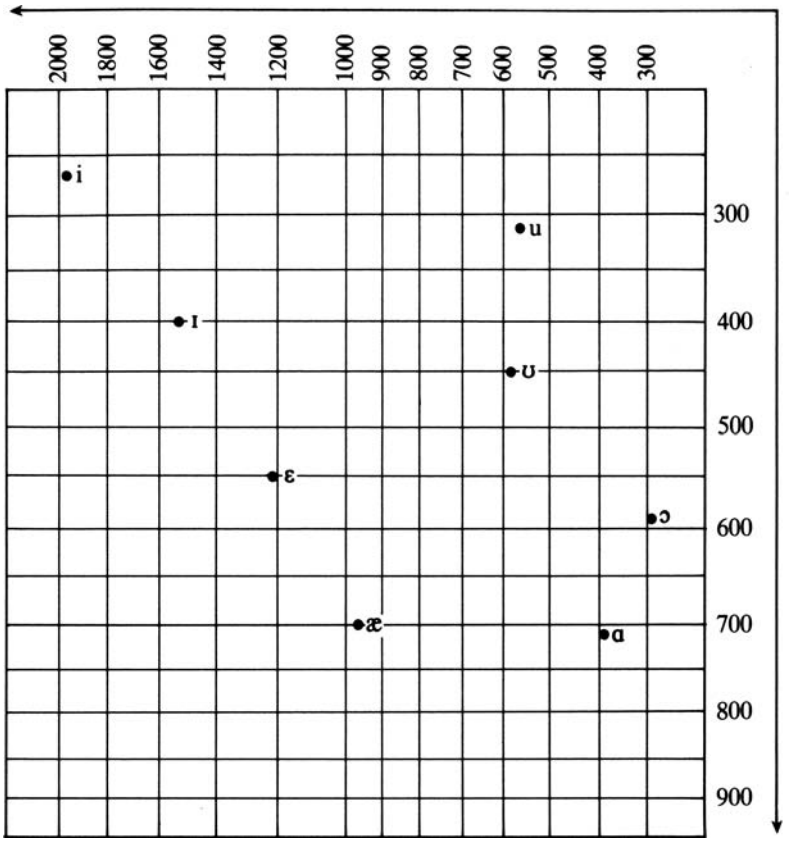

Figure 10 A formant chart showing the frequency of the first formant on the vertical axis plotted against the distance between the frequencies of the first and second formants on the horizontal axis for the eight American English vowels in Figure 9.

Assume a sequence [apa], and examine the behaviour of the lips. They are wide open for both [a]s, but completely closed for [p]. Though rapid, both the opening and closing of the lips is a time-taking process and, if we slow it down, one can imagine the process shown in Figure 12.

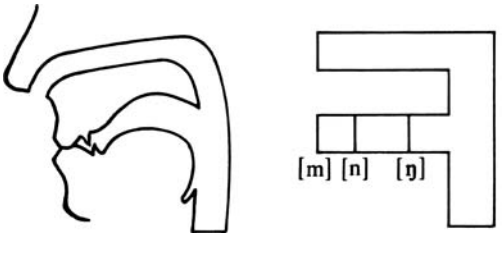

Figure 11 The vocal-tract shape and the idealised tube shape for nasal consonants [m], [n] and [ŋ].

Now, as we have seen, vowels have their own resonance frequencies, called formants. A closed tube, such as the one that a plosive assumes, can also be said to have its own resonance frequency, although it is inaudible because no energy escapes from the closed tube (for what it is worth, it is $\frac{v}{2l}$). If we take the resonance frequency (i.e. formant) of the vowel to be *x*, and the resonance frequency of the plosive to be *y*, then the closing and opening of the lips can be seen to be, acoustically speaking, a transition from *x* to *y* and then from *y* to *x*. It is this formant transition towards and from the assumed value of the consonant's resonance frequency that is responsible for the perception of plosives. This imagined place of origin of formant transitions is called **locus**. As for different places of plosives, the lengths of a closed tube for [p],

[t] and [k] are different from each other; so would be the loci of these plosives; and so would be the transitional patterns. They are shown schematically in Figure 13.

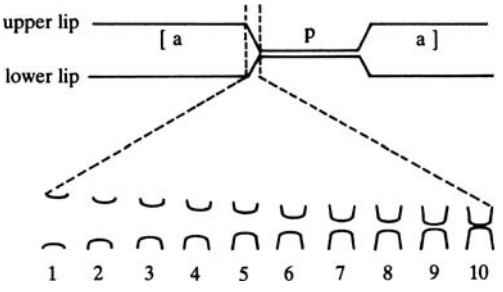

Figure 12 A schematic diagram of the closing of lips in [apa], its progression slowed down in ten steps.

It can be seen that all formants rise rapidly from plosive to vowel in [pa], while higher formants fall in [ta], but converge in [ka].

A machine designed to analyse/decompose sound into its acoustic parameters, much as a prism splits light into its colour spectrum, is called a **spectrograph**, and its product is a **spectrogram**. A normal spectrogram shows frequency (ordinate) against time (abscissa), with relative intensity indicated by degrees of darkness of spectrogram. A spectrogram of English words *bab*, *dad* and *gag* is shown in Figure 14 (adapted from Ladefoged 2006: 192). Compare this with the schematic spectrogram of Figure 13.

In addition to the formant transitions, a noise in the spectrum generated by a turbulent airstream characterises fricatives and affricates. This noise may vary in its frequency range,

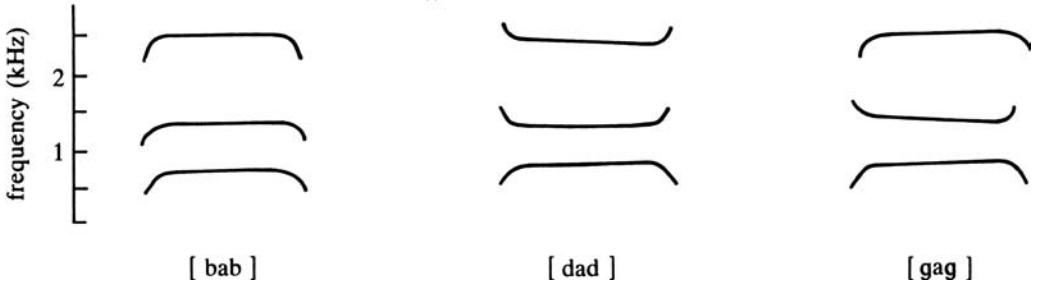

Figure 13 A schematic spectrogram of the words [bab], [dad] and [gag], showing different patterns of transitions of upper formants for different places of articulation. Compare this with the real spectrogram in Figure 14.

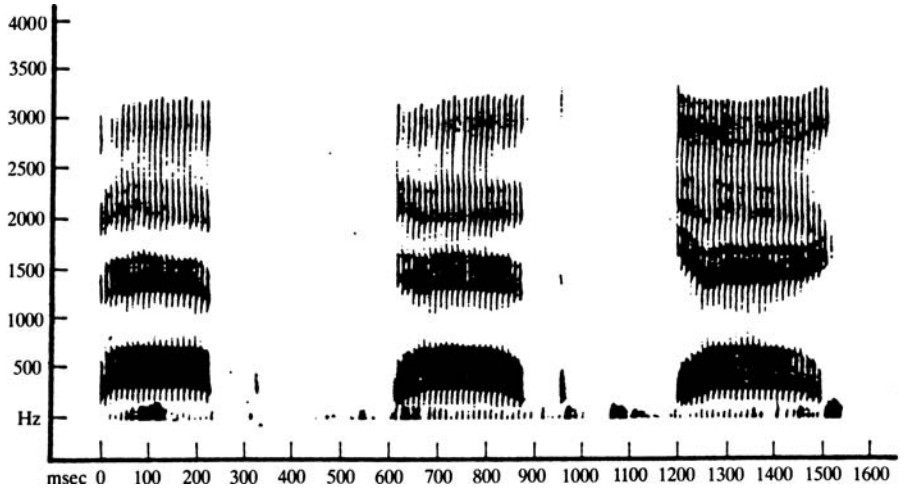

Figure 14 A spectrogram of the words [bab], [dad] and [gag]. Compare with Figure 13.

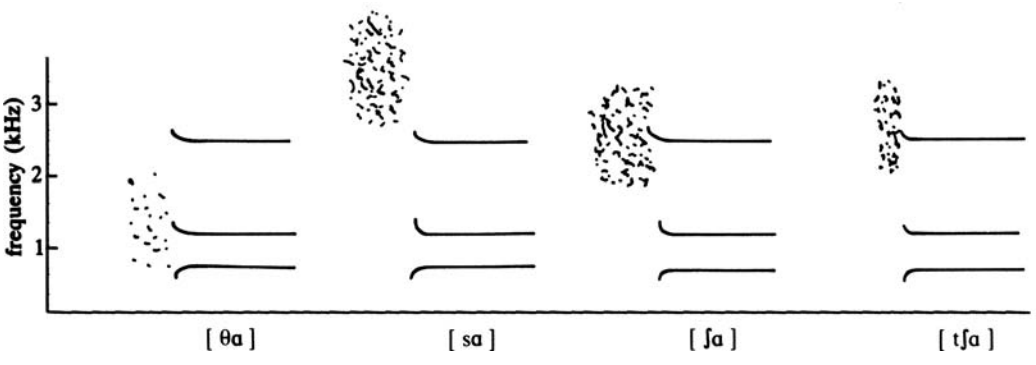

Figure 15 A schematic spectrogram showing different fricatives. Note that the difference between [*s*] and sibilants is in the noise intensity; in the noise frequency between [s] and [ʃ]; and in the noise duration between [ʃ] and [tʃ].

intensity and duration depending upon the location and manner of the oral constriction. In general, sibilants are stronger in noise intensity than non-sibilants ([f], [θ], [h] – [h] being the weakest); affricates have a shorter noise duration than fricatives; and [s] is higher in its frequency range than [ʃ]. See the schematic spectrograms in Figure 15.

Acoustic phonetics developed in the 1940s with the advent of the age of electronics and provided a foundation for the theory of distinctive features of Jakobson and Halle (Jakobson et al. 1951) [*see* DISTINCTIVE FEATURES], which in turn formed the basis of generative phonology in the 1950s and 1960s [*see* GENERATIVE PHONOLOGY]. Although this framework was overhauled by Chomsky and Halle (1968: especially Chapter 7), acoustic phonetics is still an indispensable tool both in instrumental phonetic research and in validation of aspects of phonological theories.

C.-W. K.

Suggestions for further reading

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Ladefoged, P. (1962/1996) *Elements of Acoustic Phonetics*, 2nd edn, Chicago, Ill.: University of Chicago Press.

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Animals and language

All species on this planet procreate. For most to do that they must encounter another individual. To do that they must exchange information; they must communicate. Communication occurs chemically through scent, vibrationally through sound, visually with light, and tactilely through contact. Many taxa use a combination of these and for each there is a unique system. Each system accommodates the organism in its particular social and ecological environment. For example elephant groups are spread out over large distances. Their seismic communication travels over long distances and their large feet are adapted to detect these vibrations as well as support their massive bodies! In contrast many birds live in trees where foliage blocks the view. Their high pitch vocalisations travel easily over short distances. Cetacean communication is well designed to work where they live, in water. The human system is based largely on speech and visual communication. The visual component includes facial expressions, postures, and gestures and overlaps with the communication system of non-human primates.

A description of each system is beyond the scope of this article, and it will concentrate on examples of communication systems used by species of bees, birds, whales, elephants and non-human primates, including human systems, both artificial and natural, that are utilised by non-human animals.

The dance of the honey bee

Von Frisch (1967), an Austrian ethologist, provided much of our knowledge of the honey bee dance. Bees dance on the hive, which indicates the location of rich food sources. Other bees follow the dancer and then go out to the food source themselves. One type of dance, the **round dance**, is used for nearby items. The bee circles alternately clockwise and counterclockwise, much like a figure eight. A second dance, the **waggle dance**, is used for distant food sources and contains information about the location and distance of the food source. The dancer waggles along a straight line then circles back and repeats. The speed and duration of the waggle portion indicate the distance to the food; the slower the dance, the longer the distance. The direction of the waggle indicates the location of the food. Usually the hive is in a dark location perpendicular to the ground. In this case the waggle line uses the direction of gravity as a reference point. The angle of the waggle line relative to the direction of gravity correlates to the angle of the line between the hive and the food to the line between the hive and the sun. If the waggle line is straight up, the bees should fly straight towards the sun to reach the food. If the waggle line is straight down, the bees should fly straight away from the sun to reach the food. If the waggle line is 40 degrees to the left of the direction of gravity, the bees should fly 40 degrees to the left of the sun. This symbolic system communicates information about something not present in the hive, which is displaced information.

Bird vocalisations

Birds communicate with vocalisations, plumage, drumming, tapping, postures, and other methods, although this section will focus only on bird vocalisations. There are many species of birds representing much diversity, so generalisations are difficult to make. Birds rely heavily on vocalisations; many species recognise conspecifics by voice. In fact, deafened turkeys will attack their own young. Bird calls are usually short bursts of sound or simple patterns of notes. There are many types: alarm calls, feeding calls, threats, begging, and social calls to maintain cohesion in the flock. Some distinct calls carry specific meaning. For example, alarm calls for flying predators sound different from alarm calls for ground predators and the birds give appropriate responses to each one. In the **playback technique**, a recording of a call is played to the birds in the absence of the predator to test the birds' response. When an aerial predator alarm call was played to laboratory chickens, they crouched down and looked up. In response to the ground predator alarm call, they ran for cover or strutted and called in a threatening way. This shows that the alarm call carries referential meaning (Evans and Marler 1993).

Much of what is known about bird vocalisation focuses on birdsong, its qualities, and acquisition. Bird songs are usually longer than calls and have elaborate patterns of pitches. Of all the types of birds, passerines (songbirds), a very diverse group including finches, scrub birds, swallows, crows, starlings, and warblers groups, most commonly sing songs. Birdsong is a male behavior and functions in breeding to attract females and stimulate hormones, and in territory marking to repulse other males. Songs may be strings of units which may be recombined in new ways.

Birdsong is learned behaviour, as evinced by Thorpe's (1961) early research. He showed that the songs of adult chaffinches raised in soundproof isolation were very different from the songs of their wild counterparts, yet they maintained the pitch, length, and subdivision of songs. But if the isolates heard tape recordings of adult male songs during rearing, their adult songs sounded like those of their wild counterparts. This is also true for sparrows. In contrast, finches did not learn from recordings, they required interaction to learn, even if it was simply turning on the recorder. A songbird also relies on hearing himself to properly develop the adult song; if deafened the songbird's songs are very abnormal. Most songbirds are genetically predisposed to learn species-specific songs. At five weeks the young chaffinch begins singing long sequences of notes called sub-songs. This develops into songs that more closely resemble the parents', and at this phase are called plastic songs. In the winter the chaffinch ceases its singing, and then in the spring it sings the sub-song blended with the plastic song. A month later this emerges into the full song. The plastic song has

more syllables than the full song; thus each generation is producing more material than is necessary. This pattern of development is common to sparrows, cardinals and buntings. Neural development parallels the pattern of song development; after a period of intense branching and growth, there is a pruning of neural connections.

Chaffinches only require adult exposure in the first few weeks of life to develop the adult song. This period of time when adult exposure is required is known as a critical period. Kroodsma (1978) reports on an experiment in which long-billed marsh wrens were systematically exposed to songs during development. They learned the most songs from twenty-five to fifty-five days of age and by the eightieth day they learned no more. The critical period for birdsong varies for different species of birds. There are similar critical periods in the development of other systems in biology, including the development of binocular vision and human speech. Once the adult chaffinch develops its song, it never changes it. Other species have variation over time, for example canary songs change every season.

Some species of songbirds show geographic variations in their songs, called regional dialects. In the Bay Area of California one can tell where a bird lives to within a few kilometres by listening to the song and identifying the dialect (Marler and Tamura 1964). Usually songs vary in relation to the distance, so birds located more closely to each other sound more alike and vice versa. Different species of birds reproduce the adult song with more or less accuracy, which also produces temporal dialects. White-crowned sparrows copy the previous generation very exactly while indigo buntings introduce slight change with each generation. Chaffinches copy with 85 per cent accuracy and some species only copy part of the previous generation's song. Variation is created by either the introduction of errors, introduction of new syllables, or recombinations of syllables.

Cetacean communication

Within the order Cetacea there are two suborders. Mysticeti are baleen **whales** – large filter feeders including humpback, minke, fin, right, blue, and gray whales. Odontoceti are toothed whales generally less than 10 metres in length including beaked, sperm and beluga whales, norwhals, porpoises and dolphins.

Baleen whales use low frequency moans, groans and thumps to communicate. Some sounds are infrasonic which is below the human range of hearing. Generally these whales travel alone or in small groups, and many are migratory. The nature of the low frequency sounds allows the sounds to travel long distances up to thousands of miles. This is underscored when the sound waves hit pressure gradients and physical features of the ocean floor, which directs the sound waves and allows them to travel further. Thus whales communicate with others hundreds of miles away. This is quite adaptive for taxa like baleen whales that are spread out over large distances.

At the breeding grounds, Baja Mexico and Hawaii for Pacific humpbacks, the males sing. Payne (1995) recorded and analysed hours of humpback songs. He noted that songs were made up of units, which were much like musical notes. These were combined and repeated into phrases. Groups of similar phrases were combined into themes. Many themes were combined and repeated into songs and songs were repeated in song sessions, which could last for hours. Songs within a geographic area were continually changing and all the individuals in the population sang the current song. Thus Pacific humpback songs were different from Atlantic humpback songs, but the rules for creating new songs were the same in both groups. Near Bermuda, humpback songs had eight to ten themes while near Hawaii songs had four to five themes. But for both groups songs could change by dropping a theme while maintaining the order of the remaining themes. Song changes happened rather rapidly; for example over two months the song could be completely different. Between breeding seasons, when humpbacks were not at the breeding area, the songs did not change. At the beginning of the next season the songs picked up where they left off in terms of change.

The toothed whales have specialised structures in the head to produce and detect sounds. They produce a large variety of high frequency pulsed sounds which are used for echolocation, navigation, hunting and social interaction. The sounds include squawks, burps, squeaks, clicks and chirps, and some are ultrasonic which is

above the human range of hearing. When sounds are combined they sound to humans like hinges or machines. Bottlenose dolphins and harbour porpoises produce pulsed yelps in courtship, squawks in distress and buzzes in aggression.

Some species of toothed whales produce unpulsed, pure tones called whistles as well as clicks. **Whistlers** include oceanic dolphins, which tend to live in large foraging groups numbering well over 100 in oceans. Whistles carry well over long distances and carry information such as predator type (Janik et al. 1994). Whistlers' clicks are acoustically different from the clicks of non-whistlers. Whistlers' clicks tend to be short and broad bandwidth while non-whistlers' clicks are long with a narrow bandwidth. Non-whistlers include many river dolphins; they tend to live in smaller groups inshore and their clicks are well adapted for this murky type of environment (Bright 1984).

Signature whistles identify individuals (Caldwell and Caldwell 1965). Male dolphins copy their mothers' signature whistle, while females do not. Males then leave the natal group, which avoids any potential confusion with the mother's whistle. The toothed orca whales live in pods, each of which has its own dialect. For example, Orcas near Vancouver, British Columbia have dialects different from those of transient pods that pass through the area (Ford and Fisher 1983).

Noise pollution in the sea produced by motors of boats may be affecting cetacean communication. There is much we do not understand or know about cetacean communication due to the difficulty of observing them in their underwater environment.

Elephants

Elephants are social, long-lived mammals that produce a variety of sounds (Moss 1988). They produce a constant low rumble that sounds like a purr or gargle to humans. This sound stops in the presence of danger and alerts others in the group. They produce infrasonic calls that can be heard by other elephants up to 10 kilometres away. These sounds are associated with danger, greeting, excitement and fear. They allow elephants to keep in contact with others from a distance, which is useful in times of limited resources. For example, should the elephants encounter a limited water supply, these far-ranging sounds can help coordinate with others so too many do not arrive at one time. Also these sounds allow males to locate fertile females, and mothers to track their calves.

Elephant infrasonic vocalisations travel through the air while their seismic vocalisations travel through the ground (O'Connell 2007). Seismic vibrations can travel 16 to 32 kilometres. Elephant feet are specially designed to be sensitive to vibration with layers of gel substances and vibration sensors.

Non-human primates

Monkeys, apes and humans communicate visually using various gestures, postures, and facial expressions in their interactions with conspecific. Additionally they all use vocalisations. Study of monkey vocalisations began with vervet monkeys. They produce acoustically distinct alarm calls for three different predators. One call is for eagles, another is for snakes, and another for leopards, and the monkeys make appropriate responses. For the snake alarm call they stand bipedally and look around. For the eagle alarm call they look up and run for cover. For the leopard alarm call they run up a tree if on the ground. Cheney and Seyfarth (1990) played recordings of an alarm call to the monkeys in the absence of the predator. The monkeys responded appropriately to the recording indicating the calls are referential. Additionally, calls are not made by individuals who are alone which means the call is more than a reflection of an internal state.

Young vervets begin to produce the alarm calls at about three months of age. Acoustically, the calls are in the adult form yet they are elicited by a broader class of animals. For example, alarm calls are elicited by numerous types of non-raptors while adults usually respond to raptors. In human language development, early language learners also give a response to a wider range of referents. For example the word 'dog' might be elicited by dogs, horses, cows and cats. Humans eventually limit the referents for the word 'dog' as do vervets with their calls. The young vervet's responses to the alarm calls are shaped by adults. At three to four months vervets most often run to mother. At four to five

months they run to mother less often and instead make inappropriate responses, ones that make them more likely to be killed. But by six to seven months all vervets are making appropriate responses. Thus production and response to calls are learned behaviours.

Vervets produce a variety of grunts that sound similar to the human ear, but which spectrograms reveal to be distinct. Four types identified by Cheney and Seyfarth (1990) include grunts to a dominant, grunts to a subordinate, grunts to an animal moving into the open, and grunts to another group. Playbacks of recordings of grunts elicit different responses. Grunts to a dominant elicited looks towards the speaker. Grunts to another group elicited looks out towards the horizon. When new males moved into a vervet group they initially produced grunts to another group in encounters with their new group members. With time, the new arrivals produced grunts to a dominant or grunts to a subordinate to group members, whichever was appropriate. The original group members also gave these intra-group grunts to the new arrivals after a time.

Other species of primates such as Diana and Campbells monkeys, tamarins and lemurs also produce referential alarm calls. Diana and Campbells monkeys share the Tai Forest in Ivory Coast. Diana monkeys respond appropriately to the calls of the Cambells monkeys. When faced with uncertain danger, for example when the predator is far away, Campbells monkeys emit a 'boom' before the alarm call. In playback experiments while the Diana monkeys responded with evasive action to the boomless calls, they did not respond to the boom calls (Zuberbühler 2002). Thus 'boom' modifies the meaning of the alarm call.

Chimpanzees, bonobos, orangutans and gorillas use gestures in free-living and captive settings. They combine these into sequences and use them appropriately based on the attentional state of the partner. When partners have their backs turned, gesturers are more likely to use an auditory or tactile gesture. If partners have visual contact, the gestures are more likely to be visual (Call and Tomasello 2007).

Chimpanzees, bonobos and orangutans in different regions use different gestures. For example, during grooming chimpanzees at Gombe Stream Reserve in Tanzania grasp an overhead branch, while just south in the Mahale Mountains the chimpanzees grasp each others' hands and hold them overhead. Researchers working at nine different long-term chimpanzee field sites collaborated and developed a list of sixty-five behaviour patterns (Whiten et al. 1999). The behaviours were classified in terms of their local frequency of occurrence. There were thirty-nine behaviours including gestures that the researchers determined were cultural variants since they were absent in some communities and customary or habitual in others. This same analysis was used to determine learned variation in gestures of bonobos (Hohmann and Fruth 2003) and orangutans. For example, orangutans in one location place a kiss squeak on a leaf while in another location they place a kiss squeak on the back of the hand (Van Schaik 2004).

Chimpanzee communities also have local variation in the form of the same gesture. This is well documented in the overhand handclasp gesture used during grooming. At Mahale, Tanzania, in the K group, partners' arms are fully extended and held palm to palm while in the M group one chimpanzee grasps the other's wrist and the arms are not fully extended. The individual who supports the wrist is always lower in dominance rank (McGrew 2004).

Human-influenced communication

Ethologists use the procedure called **cross-fostering** to study the interaction between environmental and genetic factors by having parents of one species rear the young of a different species. Primate cross-fostering projects date to the 1930s, when Kellogg and Kellogg (Kellogg 1968) raised the infant chimpanzee **Gua** for a period of nine months with their son. In the 1950s, Hayes and Hayes (Hayes and Nissen 1971) cross-fostered the chimpanzee **Viki** while attempting to teach her to talk. After four years she was able to say four words, 'mama', 'papa', 'cup', and 'up'. This research demonstrated that chimpanzees cannot speak, leading to the search for other means of testing the language and other cognitive abilities of apes.

Gardner and Gardner (Gardner et al. 1986) cross-fostered the infant chimpanzee **Washoe**

and immersed her in American Sign Language (ASL). In teaching ASL to Washoe, caregivers imitated human parents teaching human children in human homes. For example, they called attention to objects, expanded on fragmentary utterances, and moulded Washoe's hands into the shape of new signs. In a second project, the Gardners cross-fostered four more chimpanzees, **Moja**, **Pili**, **Tatu** and **Dar**. All of these cross-fosterlings acquired and used signs in ways that paralleled human children. The size of their vocabularies, appropriate use of sentence constituents, number of utterances, proportion of phrases, and inflection all grew robustly throughout the five-year cross-fostering process.

In 1979 at the University of Oklahoma Washoe adopted a ten-month-old chimpanzee son, **Loulis**. Human signing was restricted in Loulis' presence to test whether he could learn ASL from other chimpanzees rather than from humans. Loulis began to sign in one week, and at seventy-three months of age had a vocabulary of fifty-one signs. Washoe, Loulis, Tatu and Dar now live together at The Chimpanzee and Human Communication Institute (CHCI) at Central Washington University in Ellensburg, Wash. Current research shows they sign to each other and to themselves (Bodamer et al. 1994). The chimpanzees initiate conversations (Bodamer and Gardner 2002) and maintain topics. When human interlocutors feign a misunderstanding, the chimpanzees adjust their responses appropriately (Jensvold and Gardner 2000). The chimpanzees' patterns of conversation with human caregivers resemble patterns of conversation found in similar studies of human children.

In 1979 Terrace (Terrace et al. 1979) claimed to have replicated the Gardners' cross-fostering project with a chimpanzee named **Nim**. The young chimpanzee spent six hours each day in a classroom while a string of teachers drilled him with questions and demands for signing. If he wanted something, the teachers withheld it until he named it. Terrace found that Nim made few spontaneous utterances and often interrupted his teachers. This procedure differed greatly from the Gardners' cross-fostering project, in which the young chimpanzees were treated like human children. Terrace's failure to create a comparable environment for language acquisition led to Nim's failures. Later studies showed Nim made more spontaneous utterances and interrupted less in a conversational setting than in a drill setting (O'Sullivan and Yeager 1989).

In 1972 Patterson began teaching signs to an infant gorilla, **Koko**, and later **Michael**. The gorillas acquired many signs and used them in all of their interactions with their caregivers (Patterson and Gordon 1993). In 1978, at the University of Tennessee at Chattanooga, Lyn Miles taught signs to a young orangutan, **Chantek**. He produced signs spontaneously and combined them into phrases (Miles 1990). At the time of this writing Chantek lives at Zoo Atlanta in Georgia and the project continues on a modified basis.

Also in the 1970s the Gardners' research sparked research using artificial systems to examine grammatical skills in chimpanzees. Premack used plastic tokens which varied in shape and colour to represent words. **Sarah** learned rules for their order and used them to answer simple questions about attributes of objects (Premack and Premack 1983).

Rumbaugh tested a chimpanzee's grammatical ability using **Yerkish**, a system of individual symbols (known as **lexigrams**) each standing for a word, and rules for their ordering. **Lana** used lexigrams to generate sentences to ask for goods and services. Later Savage-Rumbaugh attempted to train a bonobo, **Matata**, to use lexigrams. While Matata failed to use the lexigrams, her infant son, **Kanzi**, who was present during training, did use them (Hillix and Rumbaugh 2004). Devoid of face-to-face interaction, these artificial systems reveal little about conversational behaviour, but they do demonstrate apes' capacities to use syntax.

Herman (1986) used intensive training to demonstrate dolphin comprehension of artificial symbols. The dolphin **Akeakamai** learned to respond to human hand gestures and **Phoenix** learned to respond to underwater whistle-like sounds. They both learned vocabularies of about thirty-five gestural or auditory symbols representing objects and actions. In tests of comprehension, Herman combined the symbols to create commands such as 'Frisbee fetch', and overall the dolphins responded correctly 75 per cent of the time. The symbols could be recombined to produce novel combinations and

included up to five units. Additionally the symbols could be reversed to change the meaning of the command and the dolphins' responses showed they were sensitive to these differences.

M. L. J.

Suggestions for further reading

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Aphasia

Aphasia is an **acquired language disorder** arising from brain damage. 'Acquired' signifies that language was previously intact in the speaker. 'Language' conveys that both understanding and production are involved and that written as well as spoken language is impaired. Although impaired written language is considered part of aphasia, two separate terms are used for impairments with written language, **dyslexia**, which is an acquired difficulty with reading [*see* DYSLEXIA], and **dysgraphia**, an acquired difficulty with writing. Dysgraphia denotes a problem in conveying words and sentences in the written form rather than a motoric difficulty because of hemiparesis or hemiparalysis of the arm or hand. 'Brain damage' informs us that there is a physiological cause of the condition and neurological investigations can now routinely reveal site and extent of the brain damage. The terms, '**aphasia**' and '**dysphasia**' are synonymous as total absence of language (the strict interpretation of 'aphasia') is extremely unusual. The term 'dysphasia' is still used by some clinicians in the UK but 'aphasia' is the preferred term in the international research literature. The term 'aphasia' may, controversially, be applied to language associated with language impairment in some types of dementia as the manifestations of the language breakdown are similar in the two conditions. Historically, it has also been used to signify severe developmental language impairment in children. 'Aphasia' is the appropriate term for acquired language impairment in children. It is no longer considered appropriate for another group of children who fail to develop language along the expected lines. This developmental condition is more accurately referred to as **specific language impairment**. Although aphasia can be acquired in children and young adults, it is more often associated with the elderly.

Impairments in aphasia may affect one or more components of language: the phonological form of words, the selection of words and/or the grammatical structures used. Further, understanding of language is usually impaired to some degree. The severity of impairment varies from mild, barely discernable problems to severe cases when the individual is unable to use language to communicate and cannot understand spoken language. As well as varying in overall severity, impairment may be more severe in one domain of language and here a distinction has traditionally been drawn between impairments in lexico-semantic domains and impairments within the grammar. Within these two domains, further distinctions can be observed. First, access to lexical meaning may be disturbed or the aphasic speaker's ability to convey meaning may be reduced. Second, the form of a word, that is production or processing of individual speech sounds, may be impaired and/or the accessing or processing the meaning of words may be impaired. At the level of individual speech sounds, a distinction is made between errors that are described as phonological or phonemic and assumed to be part of the mental representation of words, and errors that arise because of poor muscular control. Speech errors that are a consequence of impaired muscle control or reduced muscle strength are not considered to be part of aphasia but belong to a separate group of disorders, the **dysarthrias**. In practice, it may be difficult to distinguish between speech errors arising from dysarthria and aphasia especially immediately following brain damage. However, most aphasic speakers do not have trouble with controlling speech musculature but have problems in the production of words with the correct form and meaning and/or comprehension of the meaning of words. Many also have problems with the production of grammatical sentences and using grammatical markings for tense. Understanding of language may break down because of limited access to lexical and sentential

meaning. Thus we see that language can be impaired within the phonological, semantic, syntactic and morphological domains, in all domains, some or one. Teasing apart the strands of language impairment and building theoretical accounts of the deficits observed in one or more individual with aphasia has proved to be a rich field of research.

The most common cause of aphasia is a cerebral vascular accident (CVA), in lay terms, a stroke, affecting the dominant, in most people, the left side of the cerebral hemisphere. As the term implies, a CVA arises from problems in the blood supply to the brain, commonly from a blockage (a thrombosis or embolism) in a blood vessel. If brain cells are deprived of the oxygen and nutrients brought by the blood, they quickly die. Haemorrhages and tumours also cause brain damage by compression and, in the case of some tumours, invasion of cells. Aphasia may arise from accidental or deliberate head injuries (for example, in the case of war) but outside war zones, the most frequent cause is some type of stroke. Cerebral damage usually has to involve the left cerebral hemisphere (in right handed people) to cause aphasia although right sided damage may, exceptionally, result in aphasia. This condition is known as **crossed aphasia**.

Stroke is the most common cause of long-term disabilities in Europe. The Stroke Association estimates that every year approximately 150,000 people in the UK have a stroke. Approximately two-thirds of all stroke victims survive and of these, between one-third and a half will have aphasia. Life expectancy following stroke is increasing in the UK so it follows that a large number of people will survive with some degree of aphasia. In some cases, the condition will resolve in the first months following stroke, but for the majority, aphasia is a chronic condition. There are no reliable figures of the number of people with aphasia alive in the UK.

Aphasia is manifested in a number of ways. In some cases, comprehension seems to be intact but the ability to express thoughts and feeling is severely limited. The speaker is unable to produce more than a few words at a time, cannot formulate sentences but may be able to communicate in a limited way through short phrases. For other aphasic speakers, understanding of language is impaired and although language is produced fluently with normal intonation, meaning of what is said is compromised. When comprehension is limited, the aphasic speaker may not be able to monitor their output and may not realise that their speech is not making sense. Aphasic speakers find it difficult to retrieve appropriate words and this interferes with sentence structure as well as conveying meaning. Word retrieval is problematic for all aphasic speakers but not all word classes are equally affected across all types of aphasia. For some, word retrieval is particularly problematic for free grammatical morphemes (classified by some as 'closed class' words) while for other speakers the major grammatical classes of nouns and verbs ('open class' words) present the major difficulty. And there are further distinctions. Some aphasic speakers have more difficulty with nouns compared with verbs and for others, the reverse is true. Certain psycholinguistic variables of vocabulary are thought to play a part in word retrieval. These include frequency, familiarity, imageability and name agreement (that is the degree in which non-aphasic speakers agree on the label attached to a word, usually a verb).

Fortunately for the clinician and researcher, this wide range of possible aphasic features do not occur randomly. They tend to cluster together, and there is some relationship between site of brain lesion and aphasic features. This is by no means an isomorphic relationship and the nature of relationship continues to be debated more than one hundred years after two major types of language difficulties and site of lesion were observed by Paul Pierre Broca (1824–80) (in France) and Carl Wernicke (1848–1905) (in Germany). Despite individual differences and variation in aphasic profiles, certain patterns of language impairment are recognised. These are referred to as syndromes and are identified by bundles of characteristics that tend to co-occur. Lack of obligatory defining characteristics, characteristics that occur in more that one syndrome and the observation that one syndrome may evolve into another have led some aphasiologists to abandon the framework of syndromes when talking about aphasia. However, many aphasiologists find syndromes useful shorthand and they are widely used by physicians and within the international research community.

The symptoms, or characteristics, are not necessarily obvious on a casual bed-side examination and diagnosis is usually dependent on a psycholinguistic assessment in which both production and comprehension of spoken and written language is explored. In addition, there is increasing use of instrumental procedures such as **computerised tomography** (**CAT**), (**functional**) **magnetic resonance imaging** (**fMRI** and **MRI**) and **electroencephalography** (**EEG**) in clinical practice as well as aphasia research.

Diagnosis of syndrome is largely dependent on observed language behaviour but there are some weak (or disputed) associations with area of cortical damage. The following brief descriptions outline the main types, or syndromes of aphasia listing classical assumed lesion sites as well as language characteristics. In all cases, the assumption is that cortical damage is on the left side of the brain.

The most severe form of aphasia is **global aphasia** which arises from diffuse damage typically involving frontal, parietal and temporal cortical lobes. Production and understanding of language are impaired to the extent that production may be limited to a very few words or even one or two meaningless utterances. This condition may be present in the acute stage and slowly resolve to resemble one of the less severe syndromes. In contrast, **anomic aphasia** is a mild form of aphasia. Anomia is present in all other types of aphasia but is used as a syndrome label only when the most obvious impairment is word retrieval. Open class words especially nouns are affected. Where there is good recovery, syndromes may resolve and anomia remain as the last persisting symptom of aphasia.

Broca's aphasia is associated with lesions in the lower frontal lobe anterior to the (central) Rolandic fissure. Clinically it is recognised by slow effortful speech production, reduction of closed class words and verbs and hence production of grammatical utterances, especially complex sentences, is severely reduced. There is difficulty in retrieving nouns but this tends to be superior to verb retrieval. Comprehension of conversational speech appears intact although the aphasic listener may be slower to respond than s/he was pre-morbidly. However, research over the last thirty years or so has revealed that this type of aphasia is associated with difficulty with parsing certain types of grammatical structures. Complex sentences containing passives, object cleft, object relatives and certain wh-questions are especially problematic. The well-described comprehension deficit plus reduced spoken output is associated with a subgroup of Broca's aphasia, **agrammatism** although some writers, confusingly, use the terms as synonymous.

Wernicke's aphasia, like Broca's aphasia, is a major category of aphasia and in many ways stands in contrast. Lesions associated with this type of aphasia are associated with lesions in the temporal lobe, posterior to the Rolandic fissure and encroach upon the parietal lobe. Spoken language is fluent with normal prosody but contains many sound substitutions (phonemic paraphasias), word substitutions (lexical paraphasias), non-words (neologisms) and grammatical errors (paragrammatisms). Grammatical errors are less marked than in Broca's aphasia. Speech is referentially vague and meaning is thus reduced. Comprehension of language is reduced as is the ability to self-monitor and thus communication is severely reduced in this condition. Word-finding difficulties typically affect nouns but recent research suggests that verbs are also implicated in this condition.

Speech in **conduction aphasia** is also fluent with phonemic and lexical substitutions. Comprehension is less affected than in Wernicke's aphasia: repetition is impaired. It can be viewed as a mild form of Wernicke's aphasia and Wernicke's aphasia that diminishes matches the profile of conduction aphasia. There is some debate about the site of lesion associated with this condition, which is classically described as sub-cortical, involving fibres that connect Broca's and Wernicke's aphasia, the arcuate fasciculus. The supramarginal gyrus and angular gyrus are also implicated.

Two other types of aphasia, **transcortical motor aphasia** and **transcortical sensory aphasia** are found within the traditional battery of syndromes. These conditions resemble mild forms of Broca's (transcortical motor) and Wernicke's aphasia (transcortical sensory) but all symptoms are less severe. Additionally they are the only two syndromes where repetition is well preserved. In transcortical motor aphasia, there is difficulty in initiating speech, word retrieval problems and reduced utterances as in Broca's aphasia. In transcortical sensory aphasia there is

a marked semantic deficit, fluent speech, much of it meaningless. It is thought to resemble speech found in Alzheimer's disease and thus the two conditions may be confused.

During the second part of the twentieth century, psycholinguistics had an increasing influence within aphasiology that continues into our century. Models of language processing were applied to aphasic language as well as non-aphasic language in an effort to tease apart stages of language processing and to test the independence of these assumed levels. Early simplified versions of single word processing models have been embraced by some clinicians and are used as a basis of assessment and to motivate treatment. Experiments using aphasic speakers have also been designed to test theories of the relative input of syntax and non-linguistic cognitive operations. Linguistic influences have been strong in a relatively small, although very influential area of aphasia research, that of comprehension deficits in agrammatism, a well-defined subgroup of Broca's aphasia. A number of researchers have based their theoretical assumptions about the nature of comprehension loss in agrammatism on various versions of transformational grammar, and latterly, to versions of minimalism. Research arising from different backgrounds has helped fuel the debate about the nature of aphasia. Is aphasia a deficit of language representation (and in particular, of certain syntactic structures or operations) or is it more usefully viewed as a deficit of language processing? Most researchers would support the latter view although there are cogent and vigorous arguments supporting the representational view.

However, as there is now increasing evidence that, given the correct diagnosis and access to appropriate treatment, language can improve even several years post-onset of aphasia, it is difficult to argue for loss of representation. Increasingly sophisticated neural imaging studies show that, contrary to traditional ideas about the inability of cortical matter to regenerate, neural activity can change following treatment. Treatment studies that focus on specific linguistic structures suggest that even long-term language disability may be reduced if appropriate linguistically motivated treatment is given.

S. Ed.

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Applied linguistics

Perhaps no other field in either the humanities or the social sciences has experienced as much debate and discussion in coming to terms with its self-image as has applied linguistics. The term, 'applied linguistics', was used at least as far back as the 1920s (see Coleman 1929) to refer to a linguistics-based approach to language instruction. In North America, especially during the Second World War, this approach was understood as the application of the findings of structural linguistics research to the teaching of the grammar and phonology of languages deemed important for the US war effort. Shortly after the end of the war, the first journal to include 'applied linguistics' in its title, *Language Learning*, was founded at the University of Michigan in 1948. In 1956, the University of Edinburgh established the School of Applied Linguistics under the direction of J.C. Catford, and in 1957 the Center for Applied Linguistics was founded in Washington, DC, under the direction of Charles Ferguson (Strevens 1992: 14). While the two organisations differed in scope, both shared the general aim of promoting and enhancing the teaching of the English language around the world. Despite the shift in focus towards English, the North American applied-linguistics scene did not lose its interest in languages other than English. For example, Lado's (1957) classic monograph, *Linguistics Across Cultures: Applied Linguistics for Language Teachers*, made extensive use of

illustrations from Spanish, Portuguese, Korean, Russian, Chinese and Arabic.

Over the course of its relatively brief history, applied linguistics has expanded well beyond the domain of language teaching to include such areas as second language learning, language rights and identity, multilingualism and multilingual education, literacy, language policy and planning, language disapora, translation and interpreting, speech therapy and forensic linguistics, among others. Some would even include stylistics, genre studies, discourse analysis, sociolinguistics, language socialisation and conversational analysis within its scope of (see Kaplan and Grabe 2000).

The field counts a number of internationally recognised journals among its publishing organs, including *Applied Linguistics*, the *Annual Review of Applied Linguistics*, the *International Review of Applied Linguistics*, the *International Journal of Applied Linguistics*, and the *Journal of Applied Linguistics*. These journals espouse editorial policies that have paralleled the expansion of the field and regularly publish articles in many of the areas listed above. Other journals, such as *Language Learning*, *Studies in Second Language Acquisition*, *Second Language Research* and *The Modern Language Journal*, have maintained their focus on empirical and, to a lesser extent, theoretical studies, relating to the acquisition and teaching of languages beyond the first. At least two journals focus primarily on the teaching and learning of English: *TESOL Quarterly* and the *English Language Teaching Journal*. Still others are concerned with specific subdomains, such as *Language Testing* and *The Journal of Second Language Writing*.

In addition to the number of journals, another indication of the robustness of the field is the increasing number of monograph and book-length volumes published by important academic and commercial presses, including Oxford University Press, Cambridge University Press, Blackwell, Routledge, Erlbaum, Edward Arnold, Pearson, John Benjamins, Kluwer, Multilingual Matters, Springer, Elsevier and Equinox. Attendance at conferences such as those sponsored by the American, British, German and Spanish Associations for Applied Linguistics as well as the International Association of Applied Linguistics continues to increase. There has also been remarkable growth in the number of universities around the world offering graduate degrees in applied linguistics.

Ironically, despite its prosperity, the field continues to experience an identity crisis in the sense that there is a lack of agreement on the precise nature of what it is and what applied linguists do that make them applied linguists. According to Davies and Elder (2004), the field still is uncertain as to whether it is a subject, a discipline, a profession or a vocation. Moreover, it continues to debate the precise nature of the distinction between conceptualising itself as an extension of general linguistics (i.e. linguistics applied) or as a completely separate field (i.e. applied linguistics). If the former, it seems clear that what gets applied is linguistics, but if the latter, things become a bit murkier with regard to what, if anything, gets applied.

The early Edinburgh School considered applied linguists to be consumers of linguistic theory where the task was to interpret the findings of linguistic research on how languages are learned and used in order to inform language teaching (Corder 1973: 10). In arguing for an expanded understanding of the domain of applied linguistics to include not just language teaching but also stylistics, language disabilities and translation, Crystal (1981a) proposed that not only could the findings of linguistic research be made relevant to these areas but so could its theories and research methods as well.

As applied linguistics expanded its interests beyond the domain of language teaching, it became apparent that disciplines other than linguistics would need to be drawn on in order to develop in-depth understandings and solutions to real-world language problems. Eventually, Widdowson, a disciple of the Edinburgh School, proposed a distinction between *applied linguistics* and ***linguistics applied***. The latter concept is closer to the original understanding of the term applied linguistics; that is, it assumes that language-based real-world problems can be solved exclusively through the application of linguistic theory, methods and findings (Widdowson 1980). The former term recognises that while linguistics offers important insights and solutions to language problems, and continues to form the core of applied linguistics, research from other disciplines, such as psychology, anthropology, sociology and perhaps even

philosophy and literary research can also be profitably brought to bear on these problems. According to Widdowson (2000a, 2000b), there is good reason to reject the understanding of applied linguistics as linguistics applied, since most language-based problems cannot reasonably be solved through the application of linguistic principles alone. In Widdowson's view, the applied linguist serves as a mediator between linguistics and language teaching in order to convert the abstract findings of linguistics research into knowledge that is useful for pedagogical practices (Widdowson 2000a: 28). This perspective, then, seems to mirror the earlier 'applied linguists as consumer' interpretation proposed by Corder. Unlike Corder, however, Widdowson recognises the necessity of applied linguistics to draw on disciplines outside of linguistics in order to develop its insights and recommendations.

One reason for drawing a distinction between applied linguistics and linguistics applied is the worry that as linguistics itself expands the domain of its own research interests beyond theorising about autonomous and abstract grammatical systems to recognition of the relevance of context for language use and language learning, the narrow interpretation of applied linguistics as linguistics applied could well make redundant the work of applied linguists (Widdowson 2000a). Furthermore, the need for applied linguistics to draw on disciplines outside of linguistics means that, unlike linguistics proper, it is a genuinely interdisciplinary field. Spolsky (1980: 73) argues that a more appropriate way to mark the distinction between applied linguistics and linguistics proper is to recognise that the former is a 'relevant linguistics' while the latter believes there is merit in the autonomous study of language as an object in itself divorced from any real-world use.

Another matter of some controversy is which brand of linguistics should inform the work of applied linguists. Widdowson (2000a: 29–30), for example, argues that generative theory is relevant to language teaching, but it is not the task of the theoretician to demonstrate its relevance. The applied linguist, as the mediator between theory and practice, is charged with the responsibility of realising this task. Widdowson contends, for example, that Chomsky's rejection of language learning as habit formation and recognition that acquisition is a 'cognitive and creative process' in which learners infer possible grammars on the basis of input and biologically determined constraints, has had a major impact on language teaching practice. While learners most certainly draw inferences based on what they hear and see in their linguistic surrounding, it is not at all clear, despite a good deal of research, that their inferences are constrained in the ways predicted by generative theory. What is more, Chomsky's understanding of 'creativity' is quite technical in nature and does not reflect the kind of creativity that others, such as Bakhtin (1981), Harris (1981), Vygotsky (1987), or Kramsch (1995) recognise as genuine linguistic creativity (i.e. the ability to create new meanings and forms, especially in the domain of metaphor), and it is this latter kind of creativity that might in the long run be more relevant to the language learning process.

Grabe (1992) proposes that in addition to generative research, applied linguists draw upon work in three other lines of linguistic research: functional and typological theories as seen in the work of Halliday, Chafe, Givon, Comrie and Greenberg; anthropological and sociolinguistics represented in the research of Labov, Hymes, Ochs, Gumperz, Fishman and the Milroys, and research which results in probabilistic grammars based on corpus linguistic analyses [*see* CORPUS LINGUISTICS]. Interestingly, this latter type of research is criticised by Widdowson (2000a: 24) as too narrow in scope because its focus is on what is done rather than on what is known – although it has to be added that Widdowson sees some relevance for corpus linguistics, since it is able to at least reflect a partial reality of how language is deployed in the real world.

What agreement has been achieved seems to point to applied linguistics as a field whose scope of interest is the development of solutions to language-based problems in the real world. To realise its goal, it draws on theoretical, methodological and empirical research from a wide array of disciplines, including, but not limited to linguistics. One problem with this perspective, however, is that it is not clear that all of the work that refers to itself as applied linguistics can legitimately be seen as entailing solutions to real-world problems. For instance, some of the

leading journals in applied linguistics publish articles on genre studies, discourse analysis and sociolinguistics that are potentially of interest to applied linguists, but in and of themselves do not purport to solve real-world language problems. The argument could be made, of course, that while not really applied in nature, this type of research is at least relevant to applied linguistics, and therefore could be included within its domain. But this same argument can be made for work in linguistics proper; yet it is not likely that such research would find its way into the field's journals or conferences. Where then are we to draw the line? If we draw it too broadly, everything could be included within applied linguistics; if we draw it too narrowly, some of the areas that have been traditionally included under the umbrella of applied linguistics would be left out. If applied linguistics does not stay focused on solving real-world language-based problems, then it might eventually be taken over by linguistics itself as the so-called 'parent discipline' becomes no longer content with analysis of language as an autonomous object but becomes increasingly interested in contexualised language learning and use (Widdowson 2000a). Yet, if the problem-solving focus is to be the distinguishing feature of applied linguistics, we might even question whether an area such as second language acquisition (SLA) research should be legitimately included in applied linguistics. Some SLA researchers, especially those working within the framework of universal grammar, have in fact claimed that their project is not about solving real-world problems and might better be situated within the domain of theoretical linguistics (see Gregg 1996). This argument is not without merit as such research can be construed as an attempt to explore whether or not the same constraints that operate in first-language acquisition also hold for languages acquired later in life. This is not to suggest that SLA research is not relevant to applied linguistics, but it does point out the complexities entailed in deciding whether a particular research programme meets the criteria for inclusion within applied linguistics.

In laying the foundation for linguistics as the science of languages, Saussure proposed that if linguistics was to operate as a legitimate scientific enterprise it would be necessary to overlook how people actually use and learn languages in their life world. He thus created the illusion of language as an autonomous object, akin to the objects of the physical universe, so it could then be studied in accordance with the principals of scientific inquiry (see Crowley 1996). This viewpoint has dominated much of the research in linguistics to the present day. Kaplan (1980: 64) believes, however, that despite an assumption that applied linguistic research adheres to the principles of scientific investigation, applied linguists might, on occasion, have to sacrifice allegiance to these principles in their commitment to find solutions to language-based human problems. Kaplan (1980: 63) contends that for this reason applied linguists are 'the most humanistic breed of linguists'. Perhaps, then, applied linguistics would be more appropriately situated alongside literary, historical and even some branches of psychological research as a human, rather than social sciences (see Polkinghorne 1988).

In concluding this exposition, I would like to suggest that applied linguists need no longer worry about what gets applied and whether or not it is a discipline, subject, profession or vocation. What matters is its activity. If, indeed, as is claimed in most definitions, this activity is the solving real (i.e. social) world language-based problems, then applied linguistics is a truly scientific linguistics, because it is a linguistics of praxis. Praxis is the uniquely human activity whereby theory and practice are integrated into a dialectical unity with the purpose of transforming the material circumstances in which humans live (Sanchez Vazquez 1977: 188). It dissolves the chasm between theory and so-called basic research and practice that has worried many researchers in applied linguistics. Gass and Mackey (2007: 190), for example, note that SLA researchers have been 'cautious about making direct connections between theory, research, and teaching practice'. In praxis, theory guides practice but at the same time practice, as the site where the theory is genuinely tested, informs and, if necessary, reshapes theory. According to Vygotsky (2004: 304), in dualistic orientations to science, practice is conceived of as

> the colony of theory, dependent in all its aspects on the metropolis. Theory was in no way dependent on practice. Practice

> was the conclusion, the application, and excursion beyond the boundaries of science, an operation which lay outside science and came after science, which began after the scientific operation was considered completed.

Importantly, whether or not the application of the theory, in Vygotsky's case, psychological theory, succeeded or failed, 'had practically no effect on the fate of the theory' (2004: 304). In a praxis orientation, however, 'practice pervades the deepest foundations of the scientific operation and reforms it from beginning to end. Practice sets the tasks and serves as the supreme judge of the theory, as its truth criterion. It dictates how to construct the concepts and how to formulate the laws' (2004: 304). Applied linguistics as praxis then distinguishes itself from all other approaches to the scientific study of language as the one discipline which does not restrict itself to the mere contemplation of language but which in fact develops a true understanding of its object of study by engaging in linguistically grounded transformative activity.

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Articulatory phonetics

Articulatory phonetics, sometimes alternatively called **physiological phonetics**, is a sub-branch of phonetics concerned with the study of the articulation of speech sounds. **Speech sounds** are produced through various interactions of **speech organs** acting on either an **egressive** (i.e. outgoing) or an **ingressive** (i.e. incoming) airstream. Such articulation of speech sounds is unique to human beings (*homo loquens*, 'speaking human').

The term **articulation** refers to the division of an egressive or ingressive airstream, with or without vocal vibration, into distinct sound entities through the above-mentioned interaction of speech organs. The concept of articulation in phonetics has evolved in such a way that present-day phoneticians use expressions like 'articulating/the articulation of such-and-such a speech sound' as practically equivalent to 'pronouncing/the pronunciation of a speech sound as a distinct entity' and the term 'articulation' will be used in this technical sense in what follows.

In articulatory phonetics a speech sound is primarily considered and presented as a discrete entity so that the replacement of one speech sound by another in an identical phonetic context is regarded as possible, at least in theory. However, phoneticians are also well aware that, in the vast majority of cases, speech sounds occur in sequential combination in connected speech, with the result that they partially blend into each other in such a way that the conception of speech sounds as discrete entities is unsatisfactory. Consequently, in articulatory phonetics, speech sounds are normally first presented as discrete entities showing how they are each articulated, and then as less than discrete entities showing how they articulatorily affect each other in the speech chain.

The human physiological organs which are employed for the articulation of speech sounds and which are hence called **speech organs** or **vocal organs** all have a more basically biological function than that of allowing for verbal communication by means of speech. Thus the teeth are used for chewing food; the tongue serves to push food around during chewing and then to carry it towards the food-passage into which it is swallowed; the lungs are used for breathing; the vocal folds function as a valve to prevent the accidental entry of foreign bodies into the windpipe; if foreign bodies are about to enter the wind-pipe, the vocal folds quickly close

before being pushed open again by an egressive airstream which at the same time blows the foreign bodies upwards; in other words, what happens in this case is a cough. The vocal folds also assist muscular effort of the arms and the abdomen; the vocal folds close to create a hermetic air-filled chamber below them, and this helps the muscles of the arms or the abdomen to be made rigid. The use of these biological organs for the purpose of articulating speech sounds is another property unique to human beings.

In the articulation of speech sounds, the speech organs function as follows. A well-coordinated action of the **diaphragm** (the muscle separating the lungs from the stomach) and of the **intercostal muscles** situated between the ribs causes air to be drawn into or be pushed out of the **lungs** through the **trachea** or **windpipe**, which is a tube consisting of cartilaginous rings, the top of which forms the base of the larynx.

The **larynx**, the front of which is indirectly observable from outside and is popularly known as the Adam's apple, houses the two **vocal folds**, also known as **vocal lips**, **vocal bands**, or **vocal c(h)ords**. The whole of the larynx can be moved upward – in pronouncing an **ejective** sound like [p'] – or downward – in pronouncing an implosive sound like [ɓ] – [*see* THE INTERNATIONAL PHONETIC ALPHABET for information on phonetic symbols].

The vocal folds are fixed on the front–back axis in a horizontal direction, hinged together at the front end while being mobile sideways in two opposite directions at the back end where they are mounted on the **arytenoid cartilages**, which are also mobile. The vocal folds can thus be brought close together in such a way that their inner edges, which lightly touch each other, are set into vibration by an egressive or ingressive airstream as it rushes through between them. There is then said to be **vocal vibration** or **glottal vibration** or simply **voice**, and speech sounds articulated with vocal vibration are said to be **voiced** (e.g. [b z v]). The vocal folds can be made to approach each other in such a way that air passing through them causes **friction** without, however, causing vocal vibration; this happens in the case of [h]. Also, the vocal folds can be kept wide apart from each other (as in quiet breathing) so that air passes freely between them in either direction, causing neither glottal friction nor vocal vibration; speech sounds articulated with the vocal folds thus wide apart are said to be **voiceless** (e.g. [p s f]). Furthermore, the vocal folds can be brought tightly together to form a firm contact so that no air can pass through them either inwards or outwards: the only speech sound produced when this posture of the vocal folds is assumed and then released is the **glottal plosive**, also popularly known as the **glottal stop**, i.e. [ʔ]. The space between the vocal folds is known as the **glottis**, so that the above-mentioned four different postures of the vocal folds may be viewed as representing four different states of the glottis; they are among the most important in normal speech, though other states of the glottis are possible, including those for breathy or murmured speech and creaky or laryngealised speech.

The area in which the speech organs above the larynx are situated is generally referred to as the **vocal tract**. It consists of three cavities: **pharyngeal** or **pharyngal**, **nasal**, and **oral**. The pharyngeal cavity is also known as the **pharynx**. These three cavities function as **resonators** in that a tiny voiced sound originating from the vocal folds is amplified while passing through them. The shapes of the pharyngeal and oral cavities are variously changeable, while that of the nasal cavity is unalterable.

The pharyngeal cavity is bounded by the larynx at the bottom, by the pharyngeal wall at the back, by the root of the tongue at the front, and by the area of bifurcation into the nasal and oral cavities at the top. Apart from functioning as a resonator, the pharynx is responsible for producing **pharyngeal sounds** – to be exact, **pharyngeal fricatives** – with or without vocal vibration, i.e. [ʕ] or [ħ], in the articulation of which the root of the tongue is drawn backwards to narrow the pharynx.

The nasal cavity, which is larger than the pharyngeal or oral cavity, extends from the nostrils backwards and downwards to where the nasal cavity and the oral cavity meet. The nasal cavity can be closed off from the two other cavities or can remain open to them, depending on whether the movable **soft palate** or **velum** (see below) is raised, in which case there is said to be a **velic closure**, or lowered, in which case

there is said to be a **velic opening**. Any speech sound articulated in such a way that the egressive airstream issues outwards through the nasal cavity is a **nasal sound** or a **nasalised sound**, as the case may be. On the one hand, a **nasal consonant** is produced if the air meets total obstruction at a given point in the oral cavity (e.g. [n]), or between the lips ([m]). On the other hand, a **nasalised vowel** such as [õ] is produced if the air is at the same time allowed to issue out freely through the oral cavity as well.

The oral cavity extends from where the front teeth lie to the end of the roof of the mouth at the top, and the end of the tongue at the bottom. The lips form the orifice to the oral cavity. It is in the oral cavity that further speech organs are situated, which will be examined below. Various interactions between these speech organs in the oral cavity, with or without the involvement of the lips, and with or without vocal vibration, and with or without the involvement of the nasal cavity, give rise to a number of different **manners** and **places of articulation** which are associated with a number of different speech sounds, oral or nasal, or nasalised.

Figure 1 shows the different speech organs found in the oral cavity, and the lips. The **lips** are obviously the easiest to observe from outside. They can be brought together to form a firm contact, or well separated from each other, or made to touch or approach each other lightly in such a way that audible friction may or may not occur as air passes between them. They can also be spread, or can assume a neutral unrounded posture, or can be rounded.

The teeth are next easiest to observe, particularly the upper and lower front teeth. There are of course other teeth further towards the back, including the molars, which are also important in articulating some speech sounds.

What is sometimes called the **roof of the mouth** is what phoneticians refer to as the **teeth-ridge** and the **palate**. It consists of the following:

1. the front end (convex to the tongue) which is known as the **teeth-ridge** or the **alveolar ridge**;
2. the hard (concave) immovable part which is known as the **hard palate**;
3. the soft (also concave) mucous part capable of up-and-down movement known as the **soft palate** or **velum**;
4. the pendent fleshy tip at the end of the soft palate, which is known as the **uvula**.

The **tongue** plays a prominent role in the articulation of speech sounds in the oral cavity. It is particularly versatile in the movements it is capable of making, in the speed with which it can move, and the shapes it is capable of assuming. For the purpose of describing various speech sounds articulated in the oral cavity, phoneticians conveniently divide the tongue into various parts in such a way that there is some correlation between the division of the tongue and that of the roof of the mouth. Thus, as well as (1) the **tip** or **apex** of the tongue, we have (2) the **blade**, i.e. that part of the tongue which, when the tongue is lying at rest (this state of the tongue also applies to (3) and (4) below), faces the upper teeth-ridge, (3) the **front**, i.e. that part of the tongue which faces the hard palate, and (4) the **back**, i.e. that part of the tongue which faces the soft palate. Notice that the above-mentioned division of the tongue does not include what one might call the middle or the centre of the tongue which corresponds to the area consisting of the posterior part of the front of the tongue and the anterior part of the back of the tongue and whose recognition is implied in phoneticians' general practice of talking about central vowels or centralisation of certain vowels.

Before speech sounds are articulated through the intervention of various speech organs such as have been mentioned above, movement of an airstream is required; this airstream is then variously modified by speech organs into speech sounds.

There are three types of airstream mechanism. First, there is the **pulmonic airstream mechanism**. This is initiated by the lungs, and in normal speech the airstream is egressive, that is, the air is pushed out from the lungs. **Vowels** and many of the **consonants** require this type of airstream mechanism. Second, there is the **velaric airstream mechanism**. This is initiated by **velar closure**, i.e. the closure between the back part of the tongue and the soft palate, and the airstream is always ingressive. **Clicks** require this type of airstream mechanism. Third,

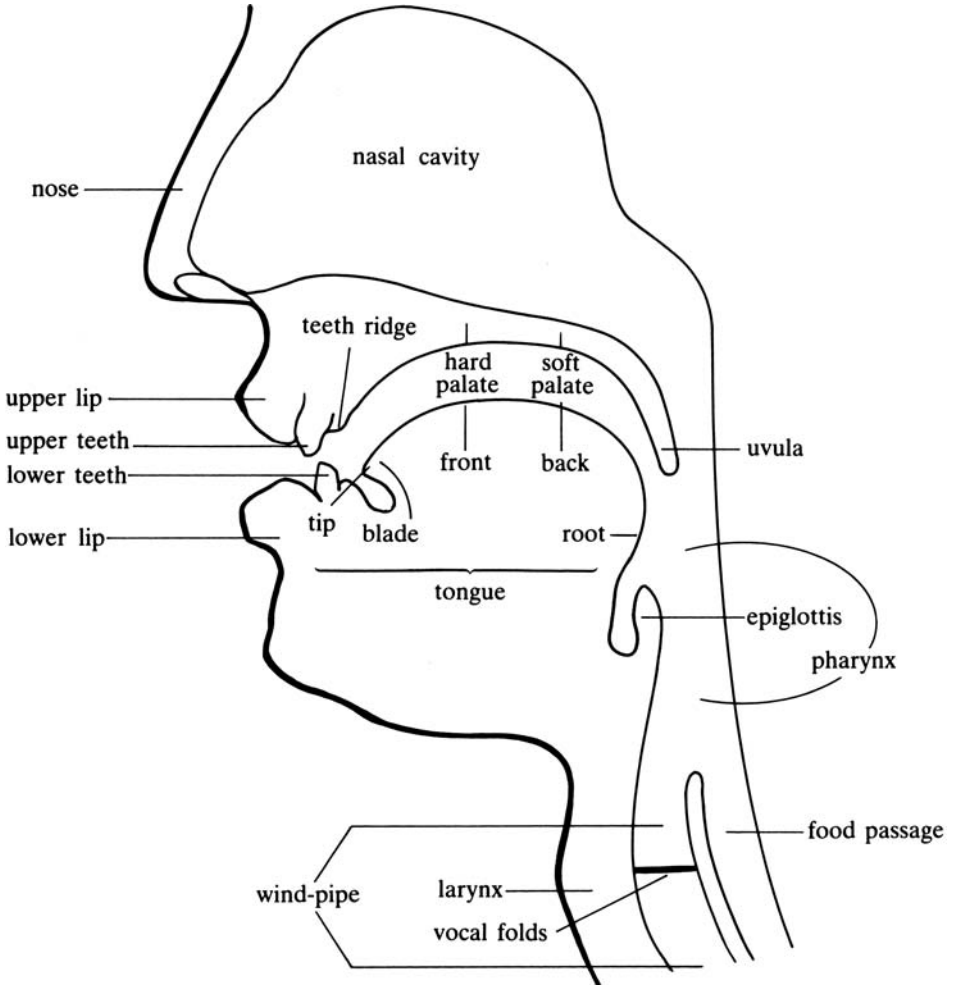

Figure 1 Speech organs.

there is the **glottalic airstream mechanism**. This is initiated by the glottis, which may be firmly or loosely closed, and the airstream is either egressive or ingressive. **Ejectives** (egressive) and **implosives** (ingressive) require this type of airstream mechanism, the firmly closed glottis for the former and the loosely closed glottis for the latter. Certain combinations of two of these types of airstream mechanism also occur.

In classifying speech sounds from the articulatory point of view, phoneticians frequently operate with the division between vowels and consonants. The so-called **semivowels**, e.g. [j w ɥ], are, articulatorily speaking, vowels.

Vowels are speech sounds in whose articulation (1) the highest part of the tongue which varies is located within a certain zone in the oral cavity which may be described as the **vowel area** (cf. the cardinal vowels discussed below) and (2) the egressive airstream from the lungs issues into the open air without meeting any closure or such constriction as would cause audible friction in the oral cavity or the pharyngeal cavity. Note that the occurrence of audible friction between the vocal folds, i.e. voice or vocal vibration, does not disqualify sounds as vowels provided there occurs at the same time no closure or constriction in any of the above-mentioned

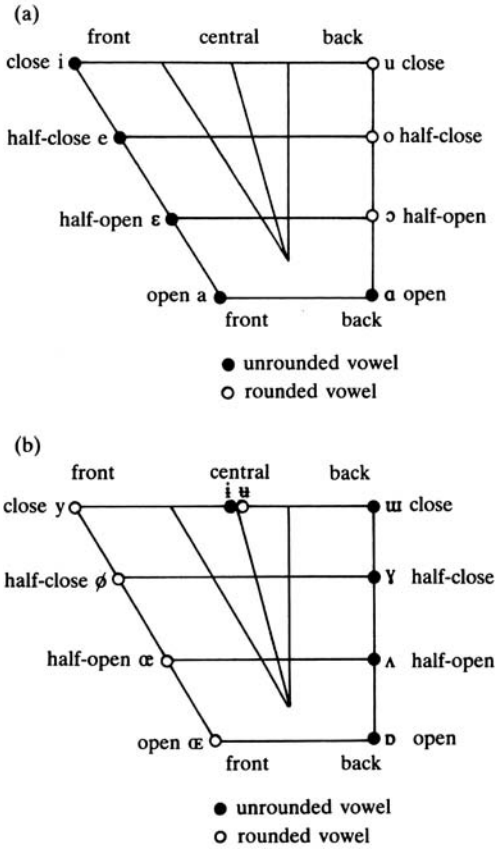

Figure 2 (a) Primary cardinal vowels (b) Secondary cardinal vowels.

cavities. Many phoneticians assume a vowel to be voiced by definition; others consider that some languages have **voiceless vowels** – indeed it is possible to argue that [h] in English is a voiceless vowel. The soft palate, when raised (cf. velic closure), prevents the airstream from entering the nasal cavity, and oral vowels are produced, e.g. [i]; but when lowered, the soft palate allows the airstream to enter the nasal cavity as well as the oral cavity, and nasalised vowels result, e.g. [õ].

In describing a vowel from the point of view of articulatory phonetics, many phoneticians customarily make use of a certain auditory-articulatory reference system in terms of which any vowel of any language may be identified. The auditory-articulatory reference system in question is the **cardinal vowel system** devised by the English phonetician, **Daniel Jones** (1881–1967). The cardinal vowel system consists, as shown in Figure 2, of eight **primary** cardinal vowels, numbered from 1 to 8, and ten **secondary** cardinal vowels, numbered from 9 to 18; all of these eighteen cardinal vowels are oral vowels.

The primary cardinal vowels are posited in such a way that no. 1, [i], is articulated with the front of the tongue as high and front as possible consistent with its being a vowel – i.e. without becoming a consonant by producing audible friction; no. 5, [ɑ], is articulated with the back of the tongue as low and back as possible consistent with its being a vowel; nos. 2, 3, and 4, [e ɛ a], are so articulated as to form an auditory equidistance between each two adjacent vowels from no. 1 to no. 5; nos. 6, 7 and 8, [ɔ o u], are so articulated as to continue the auditory equidistance, with no. 8 being articulated with the back of the tongue as high and back as possible consistent with its being a vowel. Nos. 1, 2, 3, 4 and 5 are articulated with the lips unrounded, and nos. 6, 7 and 8 with the lips rounded.

The secondary cardinal vowels are posited in such a way that nos. 9 to 16 [y ø œ Œ ɒ ʌ ɤ ɯ], correspond to the same points as nos. 1 to 8, respectively, except for the posture of the lips in terms of rounded and unrounded, which is reversed. Nos. 17 and 18, [i̟ ɯ̟], are articulated with the central part of the tongue as high as possible, consistent with their being vowels; the former is unrounded and the latter rounded. Thus, by connecting the highest points of the tongue in the articulation of all the cardinal vowels, we can conceive of what may be referred to as the **vowel area**.

Use of the cardinal vowel system enables phoneticians to specify a vowel of any given language with regard to the following: (1) the height of the part of the tongue that is the closest to the palate, the reference points being close, half-close, half-open, open; (2) the part of the tongue on the front-back axis that is the closest to the palate, the reference points being front, central, back; and (3) the posture of the lips, rounded or unrounded. In addition, phoneticians specify the posture, raised or lowered, of the soft palate, that is, whether the vowel is oral or nasalised.

Monophthongs are vowels in the articulation of which the tongue all but maintains its

posture and position, thereby maintaining practically the same vowel quality throughout, e.g. the vowels in the English words *raw*, *too*, etc. On the other hand, **diphthongs** are vowels in the articulation of which the tongue starts with the position for one vowel quality and moves towards the position for another vowel within one syllable, e.g. the vowels in the English words *no*, *buy*, etc.

Consonants are speech sounds in the articulation of which the egressive or ingressive airstream encounters either a closure or a constriction which may or may not cause audible friction. Consonants may be classified according to the **manner of articulation** on the one hand and according to the **place of articulation** on the other. According to the various manners of articulation, consonants are classified into (1) plosives, (2) fricatives, (3) affricates, (4) approximants, (5) nasals, (6) rolls, (7) flaps, (8) ejectives, (9) implosives, and (10) clicks. Note that this classification is only one of different possible ones current among phoneticians.

1. A **plosive** is a sound in whose articulation the airstream meets a closure made by a firm contact between two speech organs, which prevents the airstream from issuing beyond the point of the closure. The closure is then quickly released, but since a complete, if brief, stopping of the airstream has taken place, the sound is considered to be **non-continuant**. Some examples of plosives are [p d ʔ]. The release of a plosive may be incomplete in certain sequences of plosives or of plosives followed by homorganic affricates (see below). In English, for example, [k] in *actor* is incompletely released, while in French [k] in *acteur* is completely released; similarly, [t] in *what change* in English and the second [t] in *toute table* in French are not released.
2. A **fricative** is a sound in whose articulation the airstream meets a narrowing between two speech organs and causes audible friction as it passes through this narrowing – a **close approximation** – in the vocal tract. Some examples of fricatives are [f z h] which are **central fricatives**, and [ɬ] which is a **lateral fricative**. In the articulation of a central fricative, the egressive air issues out along the median line in the oral cavity, while in that of a lateral fricative it issues out from one or both sides of the tongue.
3. An **affricate** is a sound in whose articulation the closure made by two speech organs for a plosive is slowly and partially released with the result that what is known in phonetics as a **homorganic fricative** immediately follows. In this sense, an affricate combines the characteristic of a plosive and that of a fricative; the term **homorganic** is used in phonetics to indicate that a certain consonant is articulated in the same place in the vocal tract as another consonant articulated in a different manner. Some examples of affricates are [ʦ dɹ ʧ ʤ], which are sequences of homorganically pronounced plosives and fricatives.
4. An **approximant** is a sound in whose articulation the airstream flows continuously, while two speech organs approach each other without touching, that is, the two speech organs are in **open approximation**. Consequently, there is no audible friction – the sound is **frictionless**. Approximants, which correspond to what the IPA [*see* THE INTERNATIONAL PHONETIC ALPHABET] formerly called **frictionless continuants** and **semivowels**, are by definition any speech sounds so articulated as to be just below **friction limit**, that is, just short of producing audible friction between two speech organs. Approximants are subdivided into **lateral approximants** and **median approximants**. Examples of lateral approximants include [l ɭ ʎ], in the case of which the two speech organs which are said to approach each other are the side(s) of the tongue and the side(s) of the teeth-ridge. Some examples of median approximants are [ʋ ɹ j w ʁ].

   One particular type of speech sound which the IPA only partially recognises but which should be fully recognised as median approximants are the speech sounds to which some refer as **spirants** and which are quite distinct from fricatives. The sounds correspond to the letters *b*, *d*, and *g* in, e.g., *haber*, *nada*, and *agua* in Spanish, in the articulation of which, in normal allegro speech, there occurs no audible friction. These

spirants are often symbolised by ɓ, ɗ and ɠ, respectively, although these symbols are not recognised by the IPA. Note also that any close and 'closish' vowels, situated along or near the axis between the cardinal vowels nos. 1 and 8 or nos. 9 and 16 may justifiably be said to be approximants when they function as the so-called semivowels. Approximants thus make up a category of heterogeneous speech sounds, including as they do certain of the vowels. There are divergent identifications of some approximants on the part of individual phoneticians.

5. A **nasal** is a sound in whose articulation the egressive airstream meets obstruction at a given point in the oral cavity and is channelled into the nasal cavity – the soft palate being lowered – through which it issues out. Some examples of nasals are [m n ŋ].
6. A **roll** or **trill** is a sound in whose articulation one speech organ strikes several times against the other rapidly, e.g. [r].
7. A **flap** or **tap** is a sound in whose articulation one speech organ strikes against the other just once, i.e. [ɾ].
8. An **ejective** is a sound in whose articulation a contact or constriction made by two speech organs at a given point in the oral cavity is released as the closed glottis is suddenly raised and pushes the compressed air in the mouth outwards, e.g., [p' s' ts'], and the air issues out as the oral closure is suddenly released. An ejective can thus be a plosive, a fricative or an affricate.
9. An **implosive** is a sound in whose articulation a contact made by two speech organs in the oral cavity is released as air rushes in from outside. This is made possible by a sudden lowering of the loosely closed glottis, e.g. [ɓ], and the air then rushes further inwards as the oral closure is released. An implosive is thus a plosive as well.
10. A **click** is a sound in whose articulation a contact between two speech organs is made at a relatively forward part in the oral cavity at the same time as the closure made between the back of the tongue and the soft palate – velar closure – is released. As a result air rushes in as the back of the tongue slides backwards on the soft palate, e.g. [ǀ]. A click is a plosive or a lateral as well.

Consonants may also be classified according to various **places of articulation**. The major places of articulation are as follows:

1. **bilabial**, i.e. both lips, as in [p];
2. **labio-dental**, i.e. the lower lip and the upper front teeth, as in [f];
3. **apico-dental**, i.e. the tip of the tongue and the upper front teeth, or the tip of the tongue placed between the upper and lower front teeth, as in [θ];
4. **apico-alveolar**, i.e. the tip of the tongue and the teeth-ridge, as in [t];
5. **blade-alveolar**, i.e. the blade of the tongue and the teeth-ridge, as in [s];
6. **apico-post-alveolar**, i.e. the tip of the tongue and the back part of the teeth-ridge, as in [ɹ];
7. **palatal**, i.e. the front of the tongue and the hard palate, as in [ç];
8. **alveolo-palatal**, i.e the front of the tongue, the hard palate, and the teeth-ridge, as in [ɕ];
9. **palato-alveolar**, i.e. the tip and blade of the tongue, the back part of the teeth-ridge, and the hard palate, as in [ʃ];
10. **retroflex**, i.e. the curled-up tip of the tongue and the hard palate, as in [ʂ];
11. **velar**, i.e. the back of the tongue and the soft palate, as in [k];
12. **uvular**, i.e. the uvula and the back of the tongue, as in [q];
13. **pharyngeal**, i.e. the root of the tongue and the pharyngeal wall, as in [ʕ];
14. **glottal**, i.e. the vocal folds, as in [h].

Thus, for example, [p] is described as the voiceless bilabial plosive, [z] as the voiced blade-alveolar fricative, [ʧ] as the voiceless palato-alveolar affricate, [ŋ] as the voiced velar nasal, [ʎ] as the voiced palatal lateral approximant, [ʋ] as the voiced labio-dental approximant, [ɾ] as the voiced alveolar flap or tap, [r] as the voiced alveolar roll or trill, [p'] as the voiceless bilabial ejective, [ɓ] as the voiced bilabial implosive, and [ǀ] as the voiceless dental click.

Assimilation

It was mentioned above that speech sounds, when occurring in connected speech, partially

blend into each other. Some phoneticians talk about **combinatory phonetics** in this connection. There are a number of such combinatory articulatory phenomena, but we shall concentrate on just one such phenomenon known as **assimilation**. Assimilation is said to occur when a speech sound undergoes a change in articulation in connected speech, becoming more like another immediately or otherwise adjacent sound. In English, for example, when [m] is replaced by [ɱ] before [f] or [v], as in *comfort* or *circumvent*, in an allegro pronunciation, its bilabiality changes into labio-dentality, and the pronunciation becomes [ˈkʌɱfət] or [ˌsəːkəɱˈvent]. In French, the voicelessness of [s] as in the word *tasse* is changed into voicedness, thus [s̬] (the diacritic mark ˬ signifies voicing), in normal pronunciation of e.g., *tasse de thé*, without [s̬] being identical to [z] all the same: [tɑs̬dəte] ≠ [tɑz də te]. In English, the voice of [m] in e.g. *mall* is either partially or completely lost in e.g. *small* under the influence of the voicelessness of [s] preceding it, producing [sm̥ɔːl] (the diacritic mark ̥ signifies devoicing).

An assimilation in which a sound affects the preceding sound, as in *comfort*, *circumvent*, *tasse de thé* is said to be regressive in nature and is therefore called **regressive assimilation**; an assimilation in which a sound affects the following sound, as in *small*, is said to be progressive in nature and is therefore called **progressive assimilation**. Assimilation of these kinds relates to the question of what is called an **allophone** of a **phoneme** [*see* PHONEMICS] and to the question of a realisation of a phoneme or an **archiphoneme** [*see* FUNCTIONAL PHONOLOGY].

Segmentals and suprasegmentals

What we have seen above concerns speech sounds to which phoneticians often refer as **segmental units** or **segmentals** for short, since they are phonetic units which occur sequentially. In languages there are also what phoneticians refer to as **suprasegmental units** or **suprasegmentals** which are associated in their occurrence with stretches of segmentals and therefore are coterminous with them. They may be in other cases associated in their occurrence with single segments but ultimately have implications on multiple segments. **Intonation** and **stress** are among the better known suprasegmentals [*see* INTONATION]; another well-known segmental is **duration**: a segmental may be relatively long, i.e. a long sound (e.g., [iː] in *beet* [biːt] in English; [tː] in *itta* [itːa] 'he/she/it/they went' in Japanese), or relatively short, i.e. a short sound (e.g., [ɪ] in *bit* [bɪt] in English; [t] in *ita* [ita] 'he/she/it/they was/were (here, there, etc.)' in Japanese).

Finally, **tones** which characterise **tone languages** are, physically speaking, comparable to intonation but are assigned ultimately to **morphemes**, i.e. to the smallest linguistic units endowed with meaning [*see* TONE LANGUAGES]. Therefore, tones are, linguistically, comparable to phonemes and archiphonemes [*see* FUNCTIONAL PHONOLOGY], whose function it is to distinguish between morphemes, rather than to intonation. However, every language, be it tonal or not, has intonation.

T. A.

Suggestions for further reading

Abercrombie, D. (1967) *Elements of General Phonetics*, Edinburgh: Edinburgh University Press, Chapters 2, 4, 8, 9 and 10.

O'Connor, J.D. (1973) *Phonetics*, Harmondsworth: Penguin, Chapter 2.

Ladefoged, P. (2001) *A Course in Phonetics*, 4th edn, Boston, Mass.: Heinle and Heinle, Chapters 1, 6, 7, 9 and 10.

Artificial languages

Artificial languages are languages which were deliberately constructed, rather than developing in a linguistic community. In this article we discuss both invented languages intended for people to speak to each other, and programming languages intended for people to instruct machines. The latter and their relation to language in general will be discussed in their place below.

Artificial languages for people to speak are also known as constructed languages, or conlangs. There have been a surprisingly large number of these. Richard Harrison's bibliography of the more accessible written sources

(Harrison 2002) provides information on about 100. More comprehensive is (Dulichenko 1990, in Russian), referencing printed materials for more than 900 international language projects, and there are nearly 2,000 constructed languages in Jeffrey Henning's online collection (Henning 2007).

These languages are rarely studied by linguists, because with the exception of the very few that have achieved a substantial following and first-language speakers, they are artificial creations that do not necessarily reveal anything of the innate mechanisms of language. However, whether or not they are 'language', they form part of the history of ideas about language.

The perfect language

It is possible that all languages evolved from a single original, but whatever the truth of that hypothesis [*see* LANGUAGE ORIGINS], the idea that they did so goes back as far as the story in Genesis. Mythologically, this original language has generally been imagined to have also been a perfect language, a mirror of reality which gave to all things their true names. The idea of actually constructing such a language came to prominence in the seventeenth century, for several reasons. Latin had long been the common written language for scholarly works in Europe, but with increasing general literacy and dissemination of printed books, it was yielding to the vernaculars. Besides the linguistic divisions that this created, the vernaculars were thought unsuited to deal with the explosion of scientific knowledge from all over the world, which required new vocabulary to classify and describe it. Missionaries abroad had to preach to people who knew no European languages. Reports of the Chinese language and Egyptian hieroglyphics stimulated the idea of a 'real character', whose symbols would directly and unambiguously represent things, as those systems were believed to do, allowing all people to communicate with a common writing.

One of the first attempts to create a common language was that of Francis Lodwick (or Lodowyck) (Salmon 1972). In 1647 he published a universal writing, and in 1652 a proposal for a new language whose vocabulary would order things in accordance with their natures, and therefore be more suitable for the conduct of science. The work drew some attention but did not progress beyond a description of the grammar and the principles on which its vocabulary might be built.

George Dalgarno was the first to take such a project to completion. As with Lodwick, Dalgarno's first idea was of a universal writing, developing into the idea of a new language. His *Ars Signorum*, published in 1661, proposed a vocabulary based on a classification of things into about 20 genera, with around 1,000 basic words, to be combined as necessary to express all concepts.

The third major effort of that time was John Wilkins' *Essay Towards a Real Character and a Philosophical Language* of 1668. The greater part of the Essay is taken up with his classificatory tables, which are much more detailed than Dalgarno's, and amount to a survey of human knowledge.

A basic flaw in the idea of a universal writing was already pointed out by Descartes in a letter to Mersenne of 1629 (reprinted in Yaguello 1991). A universal writing amounts to a new language, and the burden of learning it is at least equal to that of learning an existing language; but the latter already has speakers that one can learn from.

Leibniz had a lifelong interest in a universal language, and first wrote on the subject in his *Dissertatio de Arte Combinatoria* in 1666. This is mostly concerned with a part of mathematics now known as combinatory analysis, but also contains his ideas for a philosophical language based on logic. His fundamental idea was that 'a kind of alphabet of human thought can be worked out and that everything can be discovered and judged by a combination of the letters of this alphabet and an analysis of the words made from them' (Leibniz, translated in Maat 2004: 293–4). The philosophical language that he desired would be above all an instrument of reason, 'for nothing greater can happen to men than the perfection of their mental functions' (Maat 2004: 301). He looked forward to people being able to resolve all arguments by calculating. Although he worked on the project all his life, he never completed more than a sketch of an actual language, and regretted that the construction would be beyond the capacity of one person.

Although none of the philosophical languages ever came into use, the idea persisted. In 1852 Roget credited Wilkins as an influence in the preface to his Thesaurus, and regarded a work such as his own as a prerequisite for constructing such a language.

The next step towards creating a philosophical language came with the development in the nineteenth century of mathematical logic. George Boole (1815–64) was the first to establish a system of logic in which one could truly carry out argument by calculation (Boole 1854). Mathematical logic was developed further, notably by Gottlob Frege and Bertrand Russell, and in 1910–13, Russell and A.N. Whitehead published their *Principia Mathematica*, which was a demonstration by example that all mathematical knowledge of the time could be expressed and proved within a quite minimal logical system.

Mathematical logic, and specifically the first-order predicate calculus, is now in principle the generally accepted universal language of mathematics [*see* FORMAL LOGIC AND MODAL LOGIC]. What Leibniz strove for has in this specialised field been attained: all mathematicians can agree precisely on what is a correct proof and what is not. However, mathematical arguments are never written out in full formality, except when the act of doing so is itself the purpose, for it is very tedious. *Principia Mathematica* only covered the basics of mathematics, and took three weighty volumes to do so. (The theorem that 1+1 = 2 takes more than 350 pages to reach.) In practice, it is enough to learn how to express oneself in the perfect language. Thereafter one need not trouble to do so, except when a difference over some difficult technical point requires the parties, as Leibniz envisaged, to sit down and calculate.

Now that there are computers to assist, there have been attempts to actually express all mathematical knowledge in logic, with automatically checked proofs. There are two substantial projects with this aim: Automath, initiated by N. de Bruijn in the late 1960s (Nederpelt 1994), and Mizar, begun in 1973 by Andrzej Trybulec. An entire mathematical textbook, Landau's *Grundlagen der Analysis*, has been translated into Automath, while Mizar has amassed a corpus of some 40,000 theorems. The Mizar formalism is designed to be as readable as a mathematician's verbal proof, but without any loss of rigor. It remains the case, however, that these systems are used to demonstrate that it can be done, rather than as a practical medium for mathematicians to write in.

The idea of logic as the foundation for a *human* language finally bore fruit in an actual construction in 1960, when James Cooke Brown presented his language Loglan (Brown 1989). The Loglan community later split, and a revised version based on the same principles appeared, called Lojban (Cowan 1997), but for present purposes the differences between them are slight. There is a closed class of grammatical particles for various purposes, the rest of the vocabulary being a single open class, the predicates. These perform the functions of nouns, verbs, adjectives, most adverbs, and many prepositions of natural languages. Each predicate expresses a relation between a fixed number of arguments. Grammatical particles transform predicates into the equivalent of noun phrases, that is, things that can be arguments of these relations. Other particles act as logical connectives, quantifiers, and variables, thus giving a speakable version of first-order predicate calculus. There are further particles for adverbial modifiers, conjunctions, and emotional attitudes. The grammar is formally defined and can be easily parsed by machine.

While the grammar is based on logic, the vocabulary is based on existing languages. The basic concepts (about 1,000 in Loglan and 1,400 in Lojban) are chosen so as to cover the range of everyday needs, rather than on the basis of any classification scheme. The words to denote them were constructed algorithmically from the words in the most widely spoken natural languages. (It must be admitted that the primitive predicates, which are of a rigid CVCCV or CCVCV form, generally bear little resemblance to the originals from which they were built.) Primitives can be combined to express new concepts, and combinations contracted into new words. This allows the vocabulary to expand as required for any domain of discourse. Both Loglan and Lojban are still developed and practised by their enthusiasts.

The mathematician Hans Freudenthal proposed logic as a language for communicating with aliens, should we ever discover any. In his

book (Freudenthal 1960) he gave a detailed account of how, communicating through radio and sending nothing but sequences of beeps, one might convey the basics of logic and mathematics, and work up to concepts of time, behaviour, social interaction and physical objects. He chose logic and mathematics as the starting point, since their truths are universal, and must be recognisable by anyone who has developed the technology to receive radio signals.

An international language

The eighteenth century saw the ascendance of French as the European language of the educated, and the demand for a new language faded. By the later nineteenth century, the topic was again in the air, and there arose many artificial languages of a new type, motivated purely by the goal of international communication. For the sake of easy learnability, they based their vocabularies not on any scheme of classification, as the philosophical languages had done, but by borrowing or modifying words from existing European languages sufficient to meet everyday needs. Their grammars were simplified versions of those languages.

The first such language that had any popular success was Volapük, published by Johann Martin Schleyer in 1880. Its vocabulary was largely (but distantly) based on English, with some admixture of other European languages. The craze for Volapük reached its peak with its third congress in 1889, but rapidly declined soon after.

In 1887, Ludwig L. Zamenhof published Esperanto. It draws its vocabulary mainly from the Romance languages, with some borrowings from German and a few from other languages. A few words – the correlatives – are systematically constructed *a priori*. The grammar relies on word order with few inflections. Zamenhof summarised it in a set of sixteen rules, although those rules presuppose his audience's familiarity with some European language, and a full reference grammar would be much larger. The original vocabulary contained about 900 root words, but by the use of some two or three dozen affixes they can produce many more. Thus the word for 'hospital' is *malsanulejo*, which analyses as *mal-san-ul-ej-o*, based on the root *sana*, 'healthy', and literally means 'place for sick people'. The language has grown since its creation and dictionaries now contain upwards of 15,000 root words, allowing some hundreds of thousands of derivatives.

Despite persecution under Hitler and Stalin in the twentieth century, Esperanto has survived to become the most well known and best established of all the artificial languages. It has somewhere between a few hundred thousand and 2 million second-language speakers worldwide (accurate estimates are difficult to make), and a small number of first-language speakers. It has been the medium not only for translations but also for works of original literature. Within the Esperanto movement, the original goal of becoming a universal second language for all mankind has been supplemented, and for some superceded, by a view of Esperanto as a minority language with a community and culture valuable in themselves.

In 1951 the International Auxiliary Language Association (IALA) published Interlingua, following their study of several contemporary artificial languages. For some decades, several scientific journals published abstracts in Interlingua. The IALA ceased activity in the 1950s, but several successor organisations have continued to promote the language.

One of the problems besetting all artificial international languages is the creation of offshoots, by those wishing to change the language to be more to their liking. Arguments within the Esperanto community led to the splitting off of Ido in 1907, and Volapük was reformed into Idiom Neutral in 1902. (Yaguello 1991: Appendix 2) lists many more such offshoots, which are now all but forgotten.

All of these languages based their vocabulary on a mixture of European languages, designed to be easily learnable, or even readable at sight, by people speaking those languages. Some other projects were based on a single natural language. Basic English, devised by C.K. Ogden (Ogden 1930), was simply English reduced to 850 words, plus their inflections. However, the count is misleading evidence of its learnability, as many of its words have multiple meanings, and also form a large number of phrasal verbs whose meanings must be learned separately. Latino sine Flexione was devised by the mathematician Guiseppe

Peano in 1903, and is a version of Latin, simplified by omitting most of the inflections. (The language has also been known as Interlingua, but is distinct from the IALA language.) (Libert 2004) lists fourteen other Latin-derived artificial languages.

A few international languages have a completely *a priori* vocabulary, that is, not built from the words in any existing language. No such language has met with any success.

Another use for international languages has been as an *interlingua*, an intermediate language for use in computer translation. (Neither of the artificial languages known as Interlingua is used as an interlingua in this sense.) Esperanto has been used as an interlingua, and one language, UTL (Universal Translation Language) was specifically designed for the purpose. It remains to be seen whether interlinguas can compete against either abstract representations of meaning based on linguistic theory, or the more recent statistically based methods of automatic translation currently used by services such as Google.

Despite the measure of success that Esperanto has achieved, the overwhelming trend of history since its creation has been for English to become the international language in all areas of discourse and all walks of life. This is unlikely to change in the foreseeable future.

Fiction

Many artificial languages have been invented as parts of fictional worlds. Three in particular are well known to the general public: Klingon, J.R.R. Tolkien's Elvish languages and George Orwell's Newspeak.

Klingon is the language of the warlike race of that name in the Star Trek universe. It was commissioned for the third Star Trek film and created by the linguist Marc Okrand. There have appeared a dictionary, books of grammar and cultural background, and many other materials. Okrand gave Klingon several features rare or absent in human languages, such as OVS word order, an unusual set of basic colour categories, and some properties of the phoneme inventory. The language is designed for barking out orders in the heat of battle and is devoid of all pleasantries.

J.R.R. Tolkien invented the Elvish languages Sindarin and Quenya, whose sounds are reminiscent of Welsh and Finnish, respectively. They form part of the background to *The Hobbit* and *Lord of the Rings*, although Tolkien himself wrote that he created the languages first as an aesthetic hobby, and the stories grew from them (Tolkien 1997).

George Orwell's novel *1984* describes the language Newspeak, developed by the ruling class in his dystopia as a deliberately impoverished language. Its vocabulary is designed to fit the rulers' political viewpoint, and exclude all others, to make even the thought of revolt impossible. Newspeak was also intended as a satire on Esperanto and Basic English.

The role ascribed to Newspeak presumes a strong form of the Sapir–Whorf hypothesis, that language limits thought (Whorf 1956). Whether that is true or not, the idea has played a major part in several other novels of speculative fiction.

Jack Vance's *The Languages of Pao* is a novel about the Sapir–Whorf hypothesis in its strongest and, one might say, most naive form. It describes a backward and static world whose language, Paonese, embodies passivity. The world is invaded and its conquerors impose three new languages, the better to train up three social classes which Pao lacks: Valiant for soldiers, Technicant for engineers, and Cogitant for scientists. Each language was designed to mould its speakers' thoughts into the forms appropriate for each class. (Vance gives a few illustrative examples, but he did not construct complete languages.) The people eventually combine against their oppressors, and the linguistic divisions are healed by merging the four languages into a new language that overcomes the limitations of each one.

Láadan was invented by the linguist Suzette Haden Elgin for her novel *Native Tongue* and its sequels. The language is intended to more easily lexicalise certain perceptions of women which, according to Elgin, can be talked about only with difficulty in existing languages. Its vocabulary includes words such as *widazhad* – to be pregnant late in term and eager for the end; *radúdin* – a supposed holiday that is actually a burden because of work and preparations; *honáal* – the hours between midnight and dawn. There are words for five types of friendliness and

thirteen types of love, and a range of affixes and particles to indicate speech act type, evidentiality, and the speaker's state of consciousness.

Elgin intended the language not only as background to the novel, but as an experiment in the real world. She wished to test the hypothesis that such a women's language would be taken up by women, and that its influence on thought would bring about social consequences. As it turned out, Láadan has not been taken up by significant numbers, leaving it undecided what would happen if it was.

These are of course fictions. While the strong form of the Sapir–Whorf hypothesis makes for more interesting stories, actual studies suggest that there is at most a much weaker influence of language upon thought [*see* LINGUISTIC RELATIVITY; PSYCHOLINGUISTICS].

Recreation

Many of the languages indexed by Henning are intended as international auxiliary languages, but the majority are projects of recreation. In the past, such languages might never become known to anyone but their creator, but with the spread of the Internet there has arisen a whole community of conlang enthusiasts sharing their creations with each other. As well as languages, some have created automated tools to assist in the construction of a language, for example by generating vocabularies of words from a set of phonological rules. In contrast to the negative view of the activity implied by the title of Yaguello (1991), *Lunatic Lovers of Language: Imaginary Languages and Their Inventors*; Sarah Higley acknowledges it as a worthwhile creative and artistic enterprise (Higley 2000).

A few examples from Henning's list will illustrate the range of these projects. Brithenig is an exercise in alternate linguistic history, the Romance language that might have evolved if Latin had survived in Britain and been influenced by the Celtic languages. There has been more than one attempt to construct a modern descendant of Gothic, together with an alternate history of how it survived to the present. AllNoun is an experiment in syntactic form: it contains only nouns. Solresol (a nineteenth-century project that achieved some renown in its time) is a language of musical sounds. Tsolyani forms part of the background to a fantasy novel and a role-playing game. Toki Pona is a language exploring the Sapir–Whorf hypothesis, designed to encourage positive thoughts. Ithkuil is a philosophical language, striving for compactness, logicality, and accuracy – but not practical usability, its own creator disavowing being able to speak it.

Programming languages

Programming languages and the computers that they instruct are, in a perfectly literal sense, technological embodiments of mathematical logic. Their ancestry reaches back to Leibniz's idea of a *calculus ratiocinator*, in the senses both of a machine to perform reasoning, and a language with which a person may express its operation.

A basic lesson learned by the novice programmer, and never ignored by the seasoned professional, is that a prerequisite for making a machine perform a complex task is to first think clearly about the task it is to perform. Programming languages exist to enable that clarity of thought: *a programming language is a tool for thinking about computation.*

Whatever may be the relationship between natural languages and thought, it is generally held in the computing profession that programming languages do have a profound effect on how one thinks about computation. Because the semantics of these languages is defined by what a machine does with them, the programmer cannot take Humpty Dumpty's attitude, and alter the language to fit his thoughts. He must fit his thoughts to the language. Of the language Lisp, the academic scientist E.W. Dijkstra wrote 'Lisp … has assisted a number of our most gifted fellow humans in thinking previously impossible thoughts' (Dijkstra 1982), and a similar thought from the practical end of the profession is expressed by E.S. Raymond in his essay, 'How To Become A Hacker': 'Lisp is worth learning for … the profound enlightenment experience you will have when you finally get it. That experience will make you a better programmer for the rest of your days, even if you never actually use Lisp itself a lot'. Lisp – the second-oldest programming language still in wide use – was based on the lambda calculus, a mathematical notation that came out of mathematical logic in the early twentieth century.

Every programming language embodies concepts of computation, and these can differ radically from one language to another. Most programming languages describe a computation as a sequence of operations, but in some others, a program is a mathematical expression which the machine is called on to evaluate, without any sequence being specified. In yet others, a program is a set of logical axioms, together with a proposition to be proved from those axioms. Many other conceptual variations exist within these three classes. While all programming languages are 'universal', in the sense of being able to express any computation, there has never been a language that is universally used for all applications, since some problems can be expressed more easily in the concepts of one language than another. Whenever a new field of computational applications develops – for example, creating web pages – new languages are soon created to deal with them.

The later 1990s and early 2000s have seen the development of a class of computer languages to describe things outside computing, using the 'Extensible Metalanguage' XML. XML is a language for defining languages, called XML application languages. An XML application language defines the possible structure of some class of documents, specifying all the different components that may occur in the document, in what order and in what combinations. What these components mean may or may not be defined in computational terms. For example, XML languages have been standardised for describing such things as line drawings, web pages, and business forms. XML languages are constructed to fit their subject matter, and by their standardisation to serve as common languages with which diverse software systems may exchange data. XML itself is intended to be a language fit for describing these languages.

Some applications of XML have particular relevance to the original motivation for constructing artificial languages: the perfection of human communication. There have been several attempts, of varying degrees of elaboration, to develop XML languages for representing emotional states and gestures accompanying text, marking up an utterance to be a joke, or to be spoken in a happy or sad way, etc. This can be either to overcome the limitations of written text as a medium of communication, or to specify the behaviour of animated avatars in virtual worlds. No such proposal has yet been brought to fruition.

The most recent elaboration of the idea of a computer-mediated universal language is the Semantic Web. At present, the World Wide Web contains information that is meaningful to the people who access it but not to the machines which store it. The Semantic Web is a large-scale project to create explicit representations of more and more of the meaning of the content of web pages, in a form amenable to universal mechanical understanding. It is too early to predict how much of this promise will be realised.

R. K.

Suggestions for further reading

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Attitudes to language: past, present and future

Introduction

Our views of others – our sense of their beliefs, preferences, capabilities, social attributes and so on – are influenced by our perceptions of their language and speech. It follows that our interactions with them can be mediated by these attitudes – and, as well, that these may influence

our *self*-presentations. It is hardly surprising, then, that the study of language attitudes has been integral to the sociolinguistic description of many speech communities, and that it has contributed to exercises in language planning and policy-making (Ryan and Giles 1982; Garrett et al. 2003).

Since the pioneering work of Lambert and his colleagues in the 1960s, there has been a great deal of attention given to language attitudes and their ramifications (for review, see Giles and Billings 2004). Among a number of methodological approaches, procedures that examine how listeners react to supposedly different speakers reading the same neutral passage of prose have proved particularly useful: attitudes towards speakers are measured on rating scales that typically reflect the evaluative dimensions of **competence**, **solidarity** and **dynamism**. This **matched-guise procedure** (see Lambert 1967) – employing **stimulus speakers** who can assume authentic versions of languages, dialects, accents or other speech variables – has the advantage of experimental control, since all extraneous variables are obviously constant across 'guises'. In some studies (where children's voices are to be investigated, for example), more direct methods may be required, since we cannot expect speakers to adopt more than one 'guise'. The necessity for such **verbal-guise approaches**, in which different speakers are used for each variety of interest, implies greater caution in the interpretation of results.

A fairly consistent finding across many contexts is that **standard dialect** or **prestige varieties** elicit favourable reactions to speakers. They are stereotyped as more competent and confident than their less prestigious-sounding counterparts, and what they say is given greater weight. It is interesting to note here that the listener-judges in such studies are often willing to record their language attitudes after only the briefest exposure to the stimulus voices. Such attitudes appear to be socialised in complex ways early in childhood and to persist into later life (Giles et al. 1992). Another generality is that, as the 'target' variety becomes farther removed from the prestige form, evaluations of speaker competence typically become less favourable. Speakers of **low-status varieties** can, however, possess a **covert prestige**, reflected in favourable assessments on dimensions like integrity, social attractiveness and dynamism (see Marlow and Giles 2008); this typically arises because of (middle-class) attributions of directness, 'toughness' and masculinity to non-standard varieties (see Edwards 1989).

The history and social connotations of some standard varieties – such as **RP** (**Received Pronunciation**) English – can give rise to a status that crosses national borders, while non-standard varieties are typically hierarchically organised within cultural boundaries. Across studies, the effects of many speaker and listener characteristics have been studied and, although there are demographic and contextual factors whose presence or degree influence evaluative reactions, their general patterns are remarkably stable and alterations in the socio-political fabric usually have to be quite pronounced before they give rise to significant changes in those evaluations.

When we focus on vocal features other than strictly dialectal ones, **context** has particularly powerful effects. For instance, a positive linear relationship has repeatedly been found between **speech rate** and **perceived competence**, but this may disappear when evaluative exercises are more fully contextualised; thus, Brown et al. (1985) found that when listeners were informed that a male speaker had been recorded while helping audience members with an unfamiliar topic, he was seen as just as intelligent and competent when he talked slowly as when he spoke quickly. Other features – including **lexical diversity**, **pausing**, **self-disclosure** and **pitch** – have also been manipulated, both independently and in conjunction with other **speaker attributes** (e.g., socio-economic status). Findings suggest that such variables often interact in important ways; in one example, the least favourable judgements were evoked when non-standard accent, low lexical diversity and working-class background were the interacting variables (Giles et al. 1981).

As suggested at the beginning of this section, studies have also shown a direct correspondence between reported language attitudes and actual behavioural responses to members of dialect groups, across a number of applied domains (Purnell et al. 1999; Wated and Sanchez 2006). In Britain, for example, when Dixon et al. (2002) asked for evaluations of an audio-taped police

interrogation of a suspect who was pleading his innocence, they found that a speaker with a Birmingham accent was rated significantly more guilty than was an RP speaker; this effect was magnified when the crime was the 'blue-collar' one of armed robbery.

The bases of attitudinal judgement

Setting aside dictionary definitions of dialect and accent that have typically helped to sustain the view that non-standard usage is less correct usage, it is necessary to consider the possible bases upon which **language attitudes** might rest. Three broad possibilities suggest themselves. The first is that evaluations could reflect intrinsic linguistic differences. Although this is a view that has had considerable historical support, and while it remains common at a popular level in virtually all linguistically stratified societies, linguists have convincingly demonstrated that to see languages or dialects in terms of innate superiority or inferiority is to profoundly misunderstand the nature of human language itself. A good demonstration of this was provided by Labov (1976a). He studied **Black English** (in the USA), which made an excellent test case for establishing the general linguistic validity of all dialects, since it had for so long been rejected by the white middle class, and since its speakers were victims of a prejudice that went well beyond language alone. If it could be shown that Black English was not, after all, some debased variety, this would go some way towards establishing linguistic integrity for all dialect varieties.

There were three strands to Labov's work. First, he justly criticised earlier studies whose data were flawed because they had been elicited from youngsters in unfamiliar and intimidating circumstances. Second, Labov reminded us of what casual observers had known for a very long time – the Black community is verbally rich and, like other **oral cultures** worldwide, supports and rewards those who are particularly linguistically gifted. Third, and most important of all, Labov demonstrated the rule-governed nature of Black English. The import of this sort of work is clear: there are no **sub-standard language varieties**. There are **standard dialects** (roughly, those spoken by educated people and used in formal writing) in many languages, and so it logically follows that all others must be non-standard – but this latter term is not pejorative in any technical linguistic sense. Neither Black English nor, by extension, any other non-standard dialect can be characterised as some 'approximation' to 'proper' language.

Another possibility might be that **language varieties** – although not to be seen (grammatically or 'logically') in terms of better or worse – possess different aesthetic qualities. Perhaps, then, more favourable attitudes attach to those varieties that sound better, or more mellifluous, or more musical. Many years ago, for instance, **standard English** was defended as 'one of the most subtle and most beautiful of all expressions of the human spirit' (Chapman 1932: 562). Such sentiments remain quite common and are not restricted to those speaking about English. But is it possible to put them to the test? Revealing studies have compared an **inherent value hypothesis** here with an **imposed norm hypothesis**. The former term suggests, as Wyld (1934) did, that aesthetic qualities are intrinsic, while the latter holds that they are imposed by the listener who, in hearing a standard (for instance), considers it cultured and pleasing because of the status of its speakers. In one investigation, Welsh adults listened to European French, educated Canadian French and working-class Canadian French voices (Giles et al. 1979). Asked to rate the pleasantness and prestige of the voices, the judges – who were virtually ignorant of French – did not single out any of the three varieties. Earlier studies had shown, however, a clear aesthetic preference among French speakers for European French.

Important in these demonstrations is that judges were unaware of the social connotations possessed by the different varieties in their own speech communities. The implication is that, if one removes (experimentally) the social stereotypes usually associated with given varieties, aesthetic judgements will not be made that favour the high-status standards. Anyone who watches a film or a play in which (for example) a woman dressed as a duchess speaks with a Cockney accent can appreciate the point here: someone in the audience who had an understanding of English, but not of more subtle intralinguistic variation and convention, would miss a great deal of the comedic effect. The

norms here are 'imposed' by those in the know, and the stereotypes which link beauty, or harshness, or comedy to a particular set of sounds are unavailable to others.

Having eliminated two possibilities, we arrive at the most likely basis of **attitudinal judgement**: the variant evaluations found in the social laboratory and on the street reflect, above all, listeners' perceptions of the *speakers* of given varieties. The variety itself is a trigger or stimulus that evokes attitudes (or prejudices, or stereotypes) about the community to which the speaker is thought to belong.

Attitudes in context

It is impossible here to go into any detail about the many contexts in which attitudes assume importance, but we should at least mention the home, school and language-learning settings.

There is a strong tendency for speakers of non-standard varieties to accept the unfavourable evaluations of others (the so-called 'minority-group reaction' is an example here; see Lambert 1967). While the sense that one's own speech is not very good may be a common phenomenon, it is nonetheless a disturbing one. Halliday (1968: 165) noted that 'a speaker who is made ashamed of his own language habits suffers a basic injury as a human being'. One might ask, as did Ryan (1979), why do **low-status speech varieties** continue to exist? If they are generally considered inferior, why do speakers not try to eradicate them, why is language or dialect shift not a more popular option? Non-standard speakers are hardly without adequate models for language alteration, after all – the ubiquity of the broadcast media today means that virtually everybody has at least a passive awareness of standard forms, and it is not difficult, in theory, for this to be translated into something more active (Edwards 1989). We must remind ourselves here that the solidarity function of any variety can be powerful, and even one of low status can act as a bonding agent, reinforcing group identity (see Ryan 1979). Besides, attempts to alter speech styles may be risky, and failure may lead to social marginalisation. Indeed, even success may prove too costly: a Mexican American who has 'migrated' to English might be labelled a *vendido*, a 'sell-out'; and a French Canadian, a *vendu*. It is obvious that attitudes and perceptions are of considerable importance in such social dynamics.

In the classroom, too, language attitudes figure prominently. Almost four decades ago, Gumperz and Hernández-Chavez (1972) reflected upon the important ramifications of teachers' attitudes towards what they often thought of as the 'deviant' speech styles of their pupils. Trudgill (1975: 63) noted, too, that teachers were not averse to telling (some of) their pupils that their speech was 'wrong … bad … careless … sloppy … slovenly … vulgar … gibberish'. The findings of Edwards and McKinnon (1987: 335) demonstrated that such perceptions have survived linguistic insights: teachers reported, for example, that the speech of poor children revealed an inability to articulate their thoughts, and that Black pupils 'have a slang language all their own – they will not use proper English when the opportunity arises'. It is a cruel irony that socially disadvantaged children, who clearly struggle under all sorts of very real burdens, should be weighed down still more by inaccurate attitudinal evaluations of their language.

In language-learning settings, attitudes have a more interesting role to play than might first be imagined. While variations in the context and the perceived functions of a new language are obviously important, the received wisdom has been that positive attitudes facilitate acquisition; there is a large literature on **attitude and motivation in language learning** (see Dörnyei 2003, for a recent overview). Macnamara (1973), however, appeared to take an opposing view, arguing that attitudes were of little importance here. He suggested that necessity typically overpowered attitude – and this is clearly true, since large-scale language shifts are rarely accompanied by favourable attitudes. Most historical changes in language use owe much more to socio-economic and political pressures than they do to attitudes per se. But perhaps attitudes of a sort – instrumental attitudes – *do* play a part in language shift. A mid-nineteenth-century Irishman may have hated English and what it represented, for example, while still acknowledging the necessity and long-term usefulness of the language. A pragmatic or **instrumental motivation**, then, need not imply the deeper and more **integrative motives** so dear to the

hearts of teachers keen on introducing their pupils to new languages and new cultures. Perhaps a useful distinction might be drawn between **positive** and **favourable attitude**. To remain with the Irish example, we could say that attitudes towards learning English were positive and instrumental, but not necessarily favourable or integrative.

Macnamara's related contention that pupils' second-language-learning attitudes at school were also relatively unimportant is, again, not fully nuanced. It is certainly true, as he implied, that a great failing in language classrooms has been the absence of realistic usage, but it does not follow that attitudes are of little importance. In fact, attitudes may be of considerable importance precisely because of the 'artificiality' of the language classroom; that is, where a context is not perceived as pertinent to real life, or is not seen to be necessary, attitudes may make a real difference. The importance of favourable attitudes may in some circumstances, then, vary inversely with real linguistic necessity (Edwards 2001).

Future directions

Language-attitudes research indicates, above all, that listeners can – and will – rapidly stereotype speakers' personal and social attributes on the basis of language and dialect cues, and in ways that seem to affect important social decisions made about them. Expanding upon this solid foundation, there has recently been something of a move away from traditional research paradigms, and towards an increased concern for both theory development and more expansive investigative models. Promising new approaches involve the relationships between speakers' language varieties and listeners' own social identities (Cargile and Giles 1997), and the evaluative implications of interactions among speaker dialect, speech style and narrative content (Garrett et al. 2003). As well, a new ecological approach (Giles et al. 2006) builds upon recent insights into communication patterns and attitudes at the level of local community infrastructure, combining them with social-process models of attitude (see Bradac et al. 2001). The advantage here is that the latter typically emphasise more individual and fine-grained approaches, while the former has been more concerned with the socio-cultural factors that contextualise interactions. Among other things, this new and more inclusive thrust will be better able to both encourage and reflect studies of the detailed linguistic specifications of stimulus speech samples – studies for which researchers are increasingly calling (e.g., Edwards 1999).

A related area with an important and burgeoning literature has to do with the accommodations made by speakers in different contexts and with different interlocutors (Gallois et al. 2005). Linguistic accommodation can take many forms but, whether it operates at or below the level of conscious awareness, its fundamental feature is the modification of speech patterns to converge with, or diverge from, those of others. **Accommodation** can reflect individual concerns – wanting to sound more like the boss, or intentionally departing from the usage of someone you dislike – or group ones: you may wish to emphasise your 'in-group' membership, or to solidify an ethnic or class boundary. Attitudes clearly underpin accommodative practices (Giles and Ogay 2006). Recent work by Pickering (e.g., 2006) is contributing to an expansion of scope here, as the 'psychology of dialogue' provides a natural bridge between traditional accommodation insights and work in conversational and discourse analysis

Conclusion

The comprehensive study of language attitudes is an interdisciplinary and multidimensional enterprise that has provided us with much useful information about the communicative process. It continues to expand in new directions and to embrace new insights. The central questions, however, have proved remarkably stable. What are the essential contributions that attitude makes to social interaction? What are the bases upon which evaluations and judgements are made? Why do the same broad evaluative dimensions reveal themselves as important across contexts? How are linguistic differences often translated into assessments of 'better' or 'worse', and how can scholarly insight lessen the impact of unenlightened opinion in this regard? How is it that linguistically stigmatised individuals and groups come to accept such opinion? Why does such acceptance not lead to the

eradication of language varieties of low status and prestige? What, then, are the attitudinal aspects that figure in language maintenance and language shift?

It is clear that our understanding of these sorts of questions has been greatly improved through investigations in sociolinguistics and the social psychology/sociology of language. They have, above all, reminded us of the pivotal importance of *perception*, the foundation of all our social constructions, of all our individual and group relationships. The study of language attitudes is central here because language is obviously a powerful social marker, and because attitudes themselves intertwine so comprehensively with perceptions. In this sense, language attitudes are among the most important of *all* attitudes.

H. G. and J. E.

Suggestions for further reading

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Auditory phonetics

Definition

Auditory phonetics is that branch of phonetics concerned with the perception of speech sounds. It thus entails the study of the relationships between speech stimuli and a listener's responses to such stimuli as mediated by mechanisms of the peripheral and central auditory systems, including certain cortical areas of the brain [*see* LANGUAGE PATHOLOGY AND NEUROLINGUISTICS]. It is distinct from **articulatory phonetics** which involves the study of the ways in which speech sounds are produced by the vocal organs [*see* ARTICULATORY PHONETICS], and from **acoustic phonetics** which involves the analysis of the speech signal primarily by means of instrumentation [*see* ACOUSTIC PHONETICS]. In fact, however, issues in auditory phonetics are often explored with reference to articulatory and acoustic phonetics, and there may be no clear distinction made by some speech-perception researchers between aspects of acoustic and auditory phonetics due to the fact that the two fields are so closely related.

Mechanisms involved in speech perception

Auditory perception of the sounds of speech requires that a listener receive, integrate and process highly complex acoustic stimuli which contain information ranging from relatively low to relatively high frequencies at varying intensities. Young adults can perceive sounds whose frequencies range from about 20 Hz (Hertz), i.e. twenty cycles per second, to about 20 kHz (kilo-Hertz), i.e. 20,000 cycles per second. However, this entire range is not utilised in the production of natural speech sounds; hence the effective perceptual range is much smaller. Likewise, the dynamic range of the human auditory system is extremely large – about 150 dB (decibels). That is, if the smallest amount of intensity required to detect a sound were represented as a unit of 1, the largest amount tolerable before the ear sustained damage would be 10^{15}. Needless to say, this full dynamic range is not utilised in normal speech perception.

Many of the principles concerning how acoustic stimuli are converted from sound-pressure waves into meaningful units of speech have been formulated and tested empirically since Helmholtz (1821–94) set forth his theories of hearing well over a century ago (1863). Much of the data obtained have come from psychometric, psycholinguistic, and neurolinguistic studies of humans and from physiological experiments with animals. A description of the various scaling techniques and experimental procedures utilised in studies of auditory perception is beyond the scope of the present discussion, but the major findings which have been obtained by means of such techniques and procedures will be presented.

The fundamentals of auditory phonetics can best be understood by first viewing the role of the major physiological mechanisms involved in hearing with reference to the peripheral auditory system, including the ear and the auditory nerve, and the central nervous system, including certain areas of the brain. The combined role of these systems is to receive, transduce, encode,

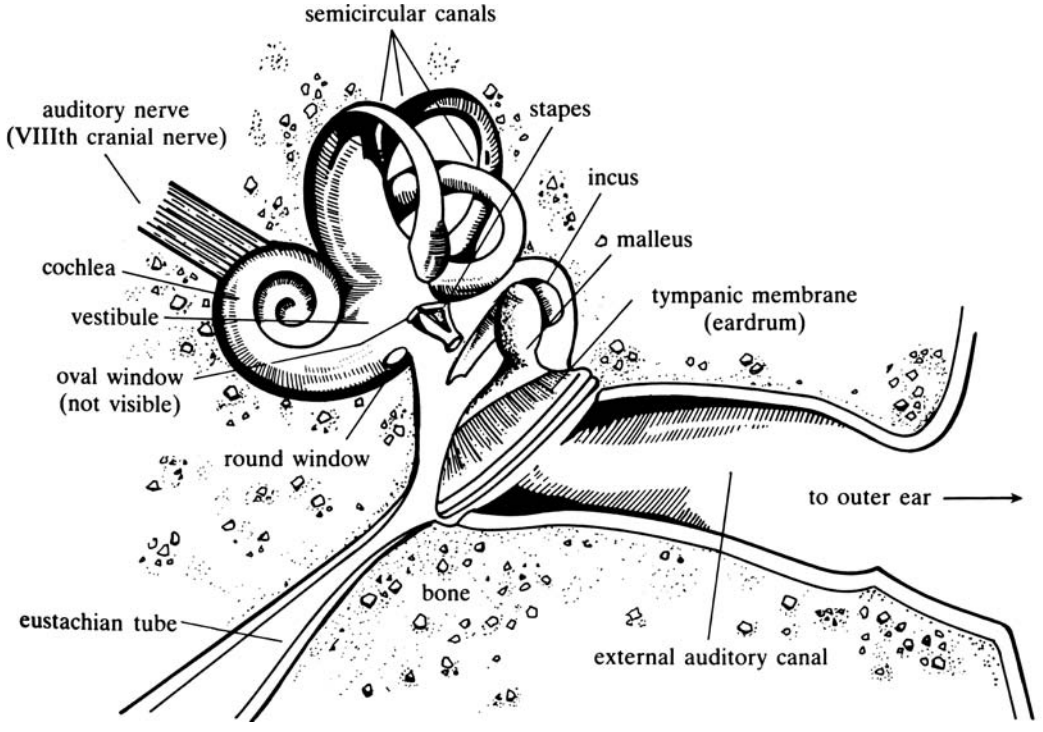

Figure 1 If the outer ear were depicted, it would appear at the far right of the figure. It would be the anterior portion of the ear, i.e. as it appears when viewed from the front. Note that, although the cochlea appears to be a discrete object, it is actually a coiled passage located within the bone of the skull. Ligaments of the ossicles are not shown.

transmit, and process an acoustic signal. Although a detailed discussion of the acoustic properties of a signal would deal with, at least, frequency, intensity, duration, and phase, the focus of the present discussion will be on frequency – perhaps the most thoroughly studied parameter and the one most relevant to a discussion of auditory phonetics.

The **ear** is divided into three anatomically distinct components, namely the outer, middle, and inner ear, as represented in Figure 1.

The **outer ear** includes the **pinna** and the **external meatus** – the visible cartilaginous structures – and the **external auditory canal** which terminates at the **tympanic membrane** or **eardrum**. The outer ear 'collects' auditory signals which arrive as sound waves or changing acoustic pressures propagated through the surrounding medium, usually air. The outer ear also serves as protection for the delicate middle ear, provides some amplification and assists in sound localisation, i.e. in determining where a sound originates.

The **middle ear** is bounded on one side by the tympanic membrane and on the other by a bony wall containing the **cochlea** of the inner ear. In addition to the tympanic membrane, the middle ear contains three **ossicles**; these are the **malleus**, **incus** and **stapes**, a set of three tiny interconnected bones extending in a chain from the tympanic membrane to the **oval window** of the cochlea. The tympanic membrane vibrates in response to the sound waves impinging upon it; the ossicles greatly amplify these vibratory patterns by transferring pressure from a greater area, the tympanic membrane, to a much smaller one, the footplate of the stapes attached to the oval window of the cochlea.

The **inner ear** contains the **vestibule**, the **semicircular canals** – which primarily affect balance – and the **cochlea**, a small coiled passage of decreasing diameter. Running the length of the cochlea are the **scala tympani** and **scala vestibuli**, two fluid-filled canals which are separated from the fluid-filled **scala media**

or **cochlear duct**. The vibratory patterns of sound-pressure waves are transferred into hydraulic pressure waves which travel through the scala vestibuli and scala tympani and from the base to the apex of the scala media.

One surface of the scala media contains a layer of fibres called the **basilar membrane**. This tapered membrane is narrow and taut at its base in the larger vestibular end of the cochlea, and wide and flaccid at its terminus or apex in the smaller apical portion of the cochlea. On one surface of the basilar membrane is the **organ of Corti** which contains thousands of inner and outer hair cells, each supporting a number of **cilia** or hairs. When the basilar membrane is displaced in response to the travelling waves propagating throughout it, the **tectorial membrane** near the outer edge of the organ of Corti also moves. It is believed that the shearing effect of the motion of these two membranes stimulates the cilia of the hair cells, thereby triggering a neural response in the auditory-receptor cells. These cells, in turn, relay electrochemical impulses to a fibre bundle called the **auditory nerve**, or the **VIIth cranial nerve**. Information about the spatial representation of frequencies on the basilar membrane is preserved in the auditory nerve, which is thus said to have **tonotopic organisation**.

The precise nature of the information received on the basilar membrane and encoded in the auditory nerve has been a matter of much investigation. The fact that the basilar membrane changes in width and rigidity throughout its length means that the amplitudes of pressure waves peak at specific **loci** or places on the membrane. Hence, the peak amplitudes of low-frequency sounds occur at the wider and more flaccid apex while the peak amplitudes of high-frequency sounds occur at the narrower and tauter base, which can, however, also respond to low-frequency stimulation. This was demonstrated in a series of experiments conducted by von Békésy in the 1930s and 1940s (see von Békésy 1960).

This finding gave rise to one version of the **place** or **spatial theory of perception** in which the tonotopic organisation of information on the basilar membrane is preserved in the auditory nerve. However, this theory does not adequately account for certain perceptual phenomena (Sachs and Young 1979). It does not, for example, account for the perception of very low-frequency sounds or the existence of extremely small **j.n.d.**s (just noticeable differences) obtained in **pure-tone experiments**, i.e. experiments which test listeners' ability to detect differences in the frequency of sounds whose wave forms are smooth and simple, rather than complex. In addition, it seems unable to account for the fact that the fundamental frequency of a complex tone can be perceived even if it is not present in the stimulus (Schouten 1940). Moreover, it has been observed that, for frequencies of about 3–4 kHz or less, auditory-nerve fibres discharge at a rate proportional to the period of the stimulus. To explain such phenomena, researchers have proposed various versions of a **periodicity** or **temporal theory**. Such a theory is based upon the premise that temporal properties, such as the duration of a pitch period, are utilised to form the psychophysical percept of a stimulus. More recently, an **integrated theory**, **average localised synchronous response** (**ALSR**), has been proposed (Young and Sachs 1979; Shamma 1985). Such a theory maintains that information about the spatial tonotopic organisation of the basilar membrane is retained, but synchronous rate information is viewed as the carrier of spectral information.

In addition, careful and highly controlled neurophysical experiments have been conducted to measure single-fibre discharge patterns in the auditory nerve of the cat (Kiang et al. 1965). These studies have sometimes utilised speech-like stimuli and have demonstrated a relationship between the phonetic features of the stimuli and the fibre's **characteristic frequency**, i.e. that frequency requiring the least intensity in stimulation to increase the discharge rate of a neuron above its spontaneous rate of firing. For example, in response to two-formant vowel [*see* ACOUSTIC PHONETICS] stimuli, it has been found that activity is concentrated near the formant frequencies, suggesting that phonetic categories are based, at least in part, upon basic properties of the peripheral auditory system (e.g., Delgutte and Kiang 1984). This finding has received support from non-invasive behaviourally based animal studies (Kuhl and Miller 1975; Sinnott and Brown 1997).

From the auditory nerve, auditory information begins its ascent to the cortex of the brain by way of a series of highly complex interconnections and routes from one 'relay station' or area to another. These interconnections and routes may be understood in general outline in the description below of the **afferent** or ascending pathway. In the description, the **nuclei** referred to are groups of nerve cell bodies. In addition to the afferent pathway, there is also an **efferent** or descending pathway, which will not be described here, which appears to have an inhibitory or moderating function.

A highly simplified description of the conduction path from auditory nerve to cortex is as follows: the auditory nerve of each ear contains about 30,000 nerve fibres which terminate in the **cochlear nucleus** of the lower brainstem. From the cochlear nucleus, some fibres ascend ipsilaterally (i.e. on the same side) to the **olivary complex**, then to the **inferior colliculus** of the midbrain via the **lateral lemniscus**. From here, fibres originate which proceed to the **medial geniculate body** of the **thalamus** and finally to the **ipsilateral auditory cortex** in the temporal lobe. Other fibres ascend contralaterally (i.e. on the opposite side) to the **accessory olive** and to the **superior olive**. They then follow a path similar, but not identical, to the one just described. In addition, other fibres originating at the cochlear nucleus proceed directly to the **contralateral dorsal nucleus**, while still others do so by way of the **ipsilateral accessory superior olive** (Harrison and Howe 1974; Yost and Nielsen 1977; Nauta and Fiertag 1979).

At the **synapses**, where information is transmitted from neuron to neuron along the route described, there is increasing complexity as well as transformation of the signal. The 30,000 fibres of the two auditory nerves feed into about a million subcortical neurons in the auditory cortex (Worden 1971; Warren 1982). In addition, at each synapse, the input is transformed (recoded) so that it can be understood at higher levels of the system (Webster 1995). It is thus not appropriate to consider the route which an auditory input follows as a simple pathway, or the synaptic junctions as mere relay stations.

The **auditory cortex**, like the auditory nerve, is characterised by tonotopic organisation. Moreover, certain of its neurons exhibit differential sensitivity to specific stimuli. For example, some are responsive only to an increase in frequency while others are responsive only to a decrease. These findings are analogous to those obtained in studies of the mammalian visual system (Hubel and Wiesel 1968) and they suggest that auditory-feature detectors subserve higher-order mechanisms of phonetic perception.

The auditory cortex alone cannot convert speech stimuli into meaningful units of language. Further processing must occur in an adjacent area in the temporal lobe known as Wernicke's area. This is graphically demonstrated by the fact that damage to this area usually results in deficits in speech perception. This language area is not present in both hemispheres and, for about 95 per cent of all right-handed adults, it and other language areas, e.g., Broca's area, are localised to the left hemisphere [*see also* APHASIA; LANGUAGE PATHOLOGY AND NEUROLINGUISTICS].

In the 1960s and 1970s, a non-invasive technique known as the **dichotic-listening test** was widely used to determine the relationship between the properties of speech sounds and the extent to which they are left- or right-lateralised in the brain. In this test, competing stimuli are presented simultaneously to both ears. For most right-handed subjects, right-ear accuracy is generally greater than left-ear accuracy for some speech stimuli, possibly because contralateral connections between the peripheral auditory and central nervous systems are stronger than the ipsilateral ones – at least when competing stimuli are presented – so that a right-ear advantage is interpreted as reflecting left-hemisphere dominance. In recent years, the reliability and validity of dichotic-listening test results have been questioned. Still, a pattern of left-hemisphere dominance for speech has been observed in sodium amytal (Wada) tests and measures of brain-wave activity, in split-brain and aphasic [*see* APHASIA] patients (Springer and Deutsch 1993), and in studies using brain-scanning techniques, such as positron emission tomography and functional magnetic resonance imaging (Fiez et al. 1996; Schlosser et al. 1998).

However, the finding of left-hemispheric dominance for speech has only emerged for certain types of speech stimuli. For example, while plosive consonants [*see* ARTICULATORY PHONETICS]

yield a right-ear advantage in dichotic-listening tasks, vowels do not (Shankweiler and Studdert-Kennedy 1967). Moreover, suprasegmental information, such as fundamental frequency, experienced subjectively as **pitch**, may or may not be mediated by the left hemisphere depending upon its linguistic status, that is, depending upon whether or not it carries linguistic information (Van Lancker and Fromkin 1973; Blumstein and Cooper 1974; Belin et al. 2000). This suggests that it is not necessarily the inherent properties of the stimuli which determine laterality effects, but the nature of the tasks to be performed as well as the status of the stimuli in the listener's perceptual system. And some researchers have asserted that the role of the left neocortex in speech processing has been overestimated and have found that the right hemisphere and subcortical structures also play an important role (Zatorre et al. 1992; Lieberman 2000).

Clearly, the relationship between the acoustic/phonetic properties of speech and its processing in the brain is complex. In attempting to understand this relationship, it is also important to make a distinction between the acoustic or auditory properties of speech, which are pre- or alinguistic, and the phonetic properties of speech, which are linguistic (Pisoni 1973). The difference is not always readily apparent, and the task is further complicated by the fact that what may be perceived as acoustic in one language may be perceived as phonetic in another. Various languages often utilise different perceptually salient cues, and these differences have measurable behavioural consequences (Caramazza et al. 1973; Cutler et al. 1986; Mack 1982, 1988, 1989).

Selected issues in auditory phonetics

One recurrent theme in auditory phonetics revolves around the question 'Is speech special?' In other words, is speech perception essentially akin to the perception of other acoustically complex stimuli or is it somehow unique? Several sources of evidence are often invoked in discussions of this issue.

First, it is apparent that the frequencies used in producing speech are among those to which the human auditory system is most sensitive, and certain spectral and temporal features of speech stimuli correspond to those to which the mammalian auditory system is highly sensitive (Kiang 1980; Stevens 1981; Lieberman 1998). This suggests a close relationship between the sounds which humans are capable of producing and those which the auditory system most accurately perceives. Indeed, experiments with prelinguistic infants have revealed that linguistic experience is not a necessary condition for the perception of some speech properties such as those involved in place and manner of articulation (Eimas et al. 1971; Kuhl 1979; Werker 1995).

Other evidence is based upon what has been termed **categorical perception**. It has repeatedly been shown that a continuum of certain types of speech stimuli differing with respect to only one or two features is not perceived in a continuous manner. Categorical perception can be summarised in the simple phrase: 'Subjects can discriminate no better than they can label'. That is, if subjects are presented with a continuum in which all stimuli differ in some specific and equivalent way, and if those subjects are required to label each stimulus heard, they will divide the continuum into only those two or three categories, such as /d–t/ or /b–d–g/, over which the continuum ranges. If these subjects are also presented with pairs of stimuli from the same continuum in a discrimination task, they do not report that members of *all* acoustically dissimilar pairs are different, even though they actually are. Rather, subjects report as different only those pair members which fall, in the continuum in that region in which their responses switch from one category to another in the labelling task. It has been argued that non-speech stimuli, such as colours and tones, are not perceived categorically; hence the special status of categorical perception of speech. However, not all speech stimuli demonstrate equally strong categorical effects, with vowel perception being less categorical than stop-consonant perception (Fry et al. 1962; Schouten and Van Hessen 1992).

Another source of evidence for the claim that speech is special may be found in **normalisation**. The formant frequencies of speech give sounds their spectral identity and are a direct function of the size and shape of the vocal tract which produces them. Hence, the frequencies which specify an [e] (as in the vowel in 'bake') produced by a child are quite unlike those which specify an [e] produced by an adult male

(Peterson and Barney 1952). None the less, both sounds are perceived as representations of the same sound unit. A process of normalisation must take place if this perceptual equivalence is to occur. It has been hypothesised that a listener 'derives' the size of the vocal tract which could have produced the sound by means of a calibration procedure in which certain vowels such as /i/ or /u/ are used in the internal specification of the appropriate phonetic categories (Lieberman 1984). If this type of normalisation occurs, it does so extremely rapidly and without conscious mediation by the listener.

The above-cited topics – the match of the perceptual system to the production system, infant speech perception, categorical perception, and normalisation – have often been interpreted as evidence that speech is special. But some linguists maintain that speech is *not* special, but rather that it is simply one highly elaborated system based upon a complex of productive and perceptual mechanisms which underlie other abilities, and even other sensory modalities, and which are thus not unique to speech.

Two other important issues involved in auditory perception are **segmentation** and **invariance**. Attempts to grapple with these issues have given rise to several major theories of relevance to auditory phonetics.

It is well known that speech is highly encoded. That is, phonetic units in a word are not simply strung together, intact and in sequence, like beads on a string. In fact, speech sounds are **smeared** or time-compressed as a result, in part, of co-articulation. The encoded nature of the speech signal makes it a highly efficient and rapid form of communication, yet it also results in the production of phonetic segments which differ, in context, slightly to substantially from the 'same' segments produced in isolation.

Closely related to the issue of segmentation is the notion of **invariance**. Various hypotheses have been proposed to account for the fact that, although given phonetic segments may be acoustically dissimilar, they are responded to perceptually as if they are identical, i.e. as if they are instantiations of the same phonetic unit. For example, the word-initial [d] in *deed* is acoustically distinct from [d] in *do:* in [di] the second-formant transition rises, while in [du] it falls. Further, in [di] the second-formant transition may start at a frequency nearly 1,000 Hz higher than does the second-formant transition in [du]. Yet both syllable-initial consonants are considered to be the same unit, /d/ – in traditional terminology, the same **phoneme** [*see* PHONEMICS]. The size and salience of the invariant unit has been a matter of considerable debate, as has its level of abstractness and generalisability (Liberman et al. 1952; Stevens and Blumstein 1978; Kewley-Port 1983; Mack and Blumstein 1983; Pisoni and Lively 1995).

Attempts to relate an acoustic signal to a listener's internal and presumably abstract representation of speech have given rise to various theories of speech perception. One of these, the **motor theory**, was developed in the 1960s. This theory related a listener's knowledge of his or her production to perception, and it was hypothesised that a listener interprets the afferent auditory signal in terms of the efferent motor commands required for its production (Liberman et al. 1967). Essentially, the activity of the listener's own neuromuscular system was believed to serve as reference for perception. A related theory, **analysis-by-synthesis**, was somewhat more complex (Stevens 1960; Halle and Stevens 1962). Here, the auditory signal is analysed in terms of distinctive features and rules for production are generated. Hypotheses about these rules are utilised to construct an internal 'synthesised' pattern of phonetic segments which is compared to the acoustic input and is then accepted or rejected. In the 1980s, some espoused the **event approach** which was based upon a 'direct-realist perspective'. In this case the problems of segmentation and invariance were minimised, for it was not presumed that a 'distorted' acoustic stimulus was mapped onto an idealised abstract phonetic unit (Fowler 1986).

These and other related theories have been termed **strong gestural approaches** in distinction to **strong auditory approaches** in which the relevant properties of a speech signal are believed to be based upon their acoustic or auditory properties (Kluender and Diehl 1989). A gestural approach can account for the fact that an articulatory target may vary but still yield an invariant percept, as in the case of vowels (Ladefoged et al. 1972; Nearey 1980). More recently it has been claimed that a strong version of either approach is inappropriate, as

revealed in the **double-weak theory** proposed by Nearey (1997). This is based upon pattern-recognition techniques and the direct mapping of speech cues onto phoneme-sised units. In short, the 1970s and 1980s witnessed a flourishing of perceptual models. (See Klatt 1989, for a review.) Many drew heavily upon issues in artificial intelligence (Klatt 1980; Reddy 1980) and on **connectionist** and **stochastic** (probabilistic) models derived from work in computational linguistics, and many have continued to do so into the new millennium.

Recent research in auditory phonetics has dealt with talker-specific effects (Nygaard and Pisoni 1998), perception in naturalistic listening conditions (Kewley-Port and Zheng 1999), age-based differences in the utilisation of acoustic cues (Werker 1995; Jusczyk 1997), and the cross-linguistic processing of phonetic units by bilinguals (Best and Strange 1992; Mack 1992; Flege et al. 1999). New conceptual approaches to speech processing have also emerged, such as the **speech learning model** (Flege 1992, 1995) and the **native language magnet model** (Kuhl 1992, 1994). These models, combined with further-refined theories and increasingly sophisticated analytic tools in neurobiology, are providing valuable information about how a 'simple' acoustic signal is transformed into a complex meaningful linguistic unit. In this way, light is being shed on issues still to be resolved in auditory phonetics.

M. M.

Suggestions for further reading

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B

Behaviourist linguistics

The psychological theory known as **behaviourism** was founded by J.B. Watson (1924). Its main tenet is that all of what some people refer to as mental activity (including language use) can be explained in terms of **habit formation**, or patterns of **stimulus** and **response**, built up through **conditioning**. These patterns of behaviour are an organism's **output**; the conditioning through which they have been formed are the **input** to the organism. Both the input and the output to the organism are observable phenomena, so behaviourism was well suited to the strong current of empiricism that swept the scientific communities in the USA and Britain early in the twentieth century.

In linguistics, one of the finest examples of the empiricist/behaviourist tradition is Leonard Bloomfield's *Language* (1933/1935), although the most rigorous application of behaviourist theory to the study of language is probably *Verbal Behavior* (1957), by Burrhus Frederic Skinner, one of the most famous behaviourist psychologists of the twentieth century. This book was severely criticised by Chomsky (1959).

In *Language*, Bloomfield insists that a scientific theory of language must reject all data that are not directly observable or physically measurable. A scientific theory should be able to make predictions, but Bloomfield points out that (1935: 33):

> We could foretell a person's actions (for instance, whether a certain stimulus will lead him to speak, and, if so, the exact words he will utter) only if we knew the exact structure of his body at that moment, or, what comes to the same thing, if we knew the exact make-up of his organism at some early stage – say at birth or before – and then had a record of every change in that organism, including every stimulus that had ever affected the organism.

Language, according to Bloomfield, is a substitute for action. He presents a story about Jack and Jill (1935: 22–7), in which the sensations of the characters are provided with 'translations' into behaviourist parlance: Jill is hungry ('that is, some of her muscles were contracting, and some fluids were being secreted, especially in her stomach'), and she asks Jack to fetch her an apple which she sees ('the light waves reflected from the red apple struck her eyes') on a tree, and so on.

Bloomfield explains that Jill's hunger is a primary stimulus, S, which, had Jill been speechless, would have led to a response, R, consisting of her fetching the apple herself, had she been capable of so doing. Having language, however, Jill is able to make 'a few small movements in her throat and mouth, which produced a little noise'. This noise, Jill's words to Jack, is a substitute response, r, which now acts as a substitute stimulus, s, for Jack, who carries out the response, R. So '*Language enables one person to make a reaction (R) when another person has the stimulus* (S)', and instead of the simple sequence of events

S⟶R

we have the more complex

S⟶r……s⟶R

and Jill gets her apple. But, again, this course of events depends on the entire life history of Jack and Jill (1935: 23):

> If Jill were bashful or if she had had bad experiences of Jack, she might be hungry and see the apple and still say nothing; if Jack were ill disposed toward her, he might not fetch her the apple, even though she asked for it. The occurrence of speech (and, as we shall see, the wording of it) and the whole course of practical events before and after it, depend upon the entire life-history of the speaker and of the hearer.

The speech event has the meaning it has by virtue of its connection with the practical events with which it is connected. So (Bloomfield 1935: 139):

> In order to give a scientifically accurate definition of meaning for every form of a language, we should have to have a scientifically accurate knowledge of everything in the speaker's world. The actual extent of human knowledge is very small, compared to this. We can define the meaning of a speech-form accurately when this meaning has to do with some matter of which we possess scientific knowledge. We can define the meaning of minerals, for example, as when we know that the ordinary meaning of the English word *salt* is 'sodium chloride (NaCl)', and we can define the names of plants and animals by means of the technical terms of botany or zoology, but we have no precise way of defining words like love or hate, which concern situations that have not been accurately classified – and these latter are in the great majority.

Bloomfield therefore advocated leaving semantics, the study of meaning, well alone 'until human knowledge advances very far beyond its present state' (1935: 140), advice which was heeded by both Zellig Harris and his pupil, Noam Chomsky – at least in the latter's early work.

Bloomfield and his followers concentrated instead on developing appropriate discovery procedures for the more easily observable aspects of language, such as its sounds and structures.

Skinner (1957), in contrast to Bloomfield, claims that it is possible to tackle linguistic meaning without recourse to the internal structure and life histories of speakers. His main aim is to provide what he calls a 'functional analysis' of verbal behaviour, by which he means an identification of the variables that control this behaviour, and a specification of how they interact to determine a particular verbal response. He describes these variables purely in terms of such notions as **stimulus**, **reinforcement**, **deprivation** and **response**, and he makes four basic claims:

1. Language behaviour can be accounted for in a way that is in principle no different from the behaviour of rats in laboratory conditions.
2. Language behaviour can be explained in terms of observable events, without reference to the internal structure of the organism.
3. This descriptive system is superior to others because its terms can be defined with reference to experimental operations.
4. So it is able to deal with semantics in a scientific way.

Skinner divides the responses of animals into two main categories:

- **Respondents**, which are purely reflex responses to particular stimuli; things like shutting your eyes if a bright light is shone at them, or kicking if your knee is hit in a particular spot by a small hammer. Clearly, these are not central to learning theory, and Skinner's research is concentrated on the second category.
- **Operants**, which constitute behaviour for which no particular obvious stimulation can initially be discovered, but which, it turns out, is susceptible to manipulation by the researcher.

A rat placed in a box will engage in **random operant behaviour**: it will run about in (what appears to the researcher to be) an unsystematic fashion, randomly pressing its nose against parts of the box. If the box contains a bar which, when pressed, releases a food pellet into a tray,

then the chances are that the rat will sooner or later press this bar and obtain a food pellet during its random operant behaviour. Then, if the rat is hungry, that is, if it suffers **deprivation**, it is likely to try pressing the bar again to obtain more food.

In Skinner's terms, the rat's pressing the bar is now becoming a **conditioned operant**, no longer random; the event consisting of the release of the food pellet is a **reinforcing event**, and the food pellet itself is the **reinforcer**. The reinforcing event will increase the strength of the bar-pressing operant; the **strength of an operant** is measured in terms of the rate of response during extinction: that is, the researcher will have observed and estimated the average number of times during a certain interval that the rat would randomly press the bar before it was adjusted to release food; they will then estimate the average number of times that the rat will press the bar once the rat has been conditioned to expect food when pressing; next, they will adjust the bar so that food is no longer released when the bar is pressed; the strength of the operant is defined in terms of how long it takes the rat to revert to its preconditioned rate of bar-pressing. The rate of the bar-pressing operant is affected by another variable, **drive**, which is defined in terms of hours of deprivation – in the case of the rat and the food pellet, hours of food deprivation.

A box such as the one just described is often called a **Skinner box**. It can be constructed in such a way that a food pellet will only be released when a light is flashing; eventually, the rat will learn this, and only press the bar when the light is flashing. In this case, the flashing light is called the **occasion for the emission of the response**, the response is called a **discriminated operant**, and what the rat has learned is called **stimulus discrimination**. If the box is so constructed that the rat only gets a food pellet after pressing for a specific length of time, then the rat will learn to press the bar for the required length of time, and what has been learned in such a case is called **response differentiation**.

Skinner (1957) now goes about applying something very like this apparatus to human verbal behaviour, which he defines as *behaviour reinforced through the mediation of other persons*. These other persons are the listeners, whose responses mediate the responses of the speaker. The hearers' responses have been conditioned precisely in order to reinforce the behaviour of the speakers. Chomsky (1959) strongly objects to the implication here that parents teach their children to speak just so that the children can, in turn, reinforce the parents' speech.

Further, Skinner suggests that children learn by imitation, although, since there is no innate tendency to imitate (nothing being innate, according to Skinner's brand of behaviourism), parents will initially respond in a reinforcing manner to random sound production on the child's part. Some of the sounds the child makes during random behaviour (not unlike the rat's random pressing of parts of the box) happen to sound like the sounds the parents make, and only these will be reinforced by the parents. Chomsky objects that children do not imitate the deep voices of their fathers, so that Skinner is using 'imitation' in a selective way, and that, in any case, he does not pay sufficient attention to the part played by the child itself in the language acquisition process.

Skinner calls utterances **verbal operants** and classifies them according to their relationship with discriminated stimulus, reinforcements and other verbal responses.

A **mand** (question, command, request, threat, etc.) is a verbal operant in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation. Chomsky suggests that this definition cannot account for cases more complex than those as simple as *Pass the salt*, when it might be appropriate to say that the speaker suffers salt deprivation. As soon as we come to utterances like *Give me the book*, *Take me for a ride*, *Let me fix it*, etc., it becomes highly questionable whether we can decide which kind of deprivation is at issue and what the required number of hours of deprivation might be.

Further, Chomsky points to the absurdity of Skinner's attempt to deal with threats in terms of the notion of aversive control. According to Skinner, if a person has a history of appropriate reinforcement, which means that if, in the past, a certain response was followed by the withdrawal of a threat of injury, or certain events have been

followed by injury, then such events are **conditioned aversive stimuli**. A person would therefore have to have had a previous history of being killed before being likely to respond appropriately to a threat like *Your money or your life*. No one has a past history of being killed. But an utterance will only be made if there is another person who mediates it, so no one should ever be inclined to utter threats like *Your money or your life*. Yet people do. And, in general, speakers are not fortunate enough always to have their mands appropriately reinforced – that is, we do not invariably get what we want.

Skinner is aware of this problem, and sets up a second category of mand, the **magical mand**, which is meant to cover cases in which speakers simply describe whatever reinforcement would be appropriate to whatever state of deprivation or aversive stimulation they may find themselves in. See below for Chomsky's comment on this type of mand.

Skinner's second main category of verbal operant is the **tact**, defined as a verbal operant in which a response of a given kind is evoked or strengthened by a particular object or event or property thereof. Some tacts are under the control of private stimuli. For instance, *There was an elephant at the zoo* is a response to current stimuli that include events within the speaker, and this is clearly a problem for a theory that claims to avoid the Bloomfieldian position that takes account of speaker-internal events.

Responses to prior verbal stimuli are of two kinds: **echoic operants**, which cover cases of immediate imitation; and **intra-verbal operants**, histories of pairings of verbal responses, which are meant to cover responses like *Four* to the stimulus *Two plus two*, and *Paris* to *The capital of France*, and also most of the facts of history and science, all translation and paraphrase, plus reports of things seen, heard and remembered.

Finally, Skinner deals with syntax in terms of responses called **autoclitics**. A sentence is a set of key responses to objects (nouns), actions (verbs) and properties (adjectives and adverbs) on a skeletal frame. Chomsky's objection to this is that more is involved in making sentences than fitting words into frames. For example, *Struggling artists can be a nuisance* and *Marking papers can be a nuisance* fit the same frame, but have radically different sentence structures. Skinner's theory cannot account for such differences.

Chomsky's (1959) overall criticism of Skinner's application of his learning theory to human verbal behaviour is that while the notions described above are very well defined for experiments in the laboratory, it is difficult to apply them to real-life human behaviour.

First, the researcher in the laboratory can predict what a rat's response to a particular stimulation will be; that is, the stimulation is known by the researcher *before* the response is emitted. But in the case of a verbal response, a tact, such as *Dutch* to a painting, which Skinner claims to be under the control of subtle properties of the painting, response prediction seems to be illusory. For, says Chomsky, suppose that someone says *Clashes with the wallpaper*, or *I thought you liked abstract art*, or *Never saw it before*, or *Hanging too low*, or whatever else – then Skinner would have to explain that, in each case, the response was under the control of some different property of the painting, but the property could only be determined *after* the response was known. So the theory is not actually predictive.

Second, while the terms used for the rat experiments may have clear definitions, it is unclear that these hold when transferred to the verbal behaviour of humans. For example, Skinner claims that proper nouns are controlled by a specific person or thing; but if this were the case, the likelihood that a speaker would utter the full name of a given person would increase when the person was in the speaker's presence, which is not necessarily the case. And it is certainly not the case that people go around uttering their own names all the time, yet this, again, would seem to be predicted by the theory. In fact, it looks as if, in this case, Skinner is merely using the term 'control' as a substitute for the traditional semantic terms, 'refers to' or 'denotes'.

Similarly, it seems that, in the case of Skinner's category of magical mands, where (according to Skinner) speakers describe the reinforcement appropriate to their state of deprivation, speakers are, in fact, simply asking for what they want. But, as Chomsky points out, no new objectivity is added to the description of verbal behaviour by replacing *X wants Y* with *X is deprived of Y*.

All in all, Chomsky shows that terms which Skinner adopts from experimental psychology do not retain their strict definitions in *Verbal Behavior*, but take on the full vagueness of ordinary language. Therefore, Skinner cannot be said to have justified his claims for the strictly behaviourist account of human language use.

K. M.

Suggestions for further reading

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Bilingualism and multilingualism

Introduction

Bilingualism and **multilingualism** are frequent phenomena in almost every country of the world. Current estimates are that between 50 per cent and 70 per cent of the world's population are bilingual or multilingual – depending partly on how a 'bilingual' is defined (see below) and the complex relationship between languages and dialects.

A person's ability in two languages was once predominant in characterisations of bilinguals. For example, Bloomfield (1933: 55) specified bilingualism as the 'native-like control of two languages'. Very few bilinguals are equally proficient in both languages and tend to use their languages for different purposes in different contexts and with different people. **Balanced bilingualism** is rare in individuals and is more of an idealised concept.

Recent characterisations of bilinguals have added use of languages to language ability – for example, portraying the different purposes of dual language use, codeswitching behaviours, parental strategies in raising bilingual children, and the economic/social/cultural/religious/educational and political use of bilingualism. This discussion is continued below, since bilingual usage can be individual but also at the societal level. Such an individual/societal distinction has led to different linguistic, psychological, neurolinguistic, sociolinguistic, cultural and political research and theory. We begin with individual bilingualism – the realm of linguists and psychologists in particular.

Individual bilingualism

Inexactness in defining individual bilingualism is apparent when attempting to provide simple answers to the following questions:

1. At what point does a second language learner become a bilingual?
2. If someone has ability in a language but does not use it, are they a bilingual?
3. How do the four language skills (understanding, speaking, reading and writing) relate to classification of who is a bilingual or not?
4. Do multilinguals have the same or different proficiency and usage profiles as bilinguals?
5. Since ability in, and use of two languages varies over time, how stable are bilinguals in their language repertoire?

Each question shows that there are no simple classifications, just multitudinous shades of colour among bilinguals (see Baker 2006 for a full discussion of these issues).

However, the following central issues help clarify the concept of individual bilingualism.

The difference between **ability** in language and **use** of language is usually referred to as the difference between *degree* (proficiency or competence in a language) and *function* (use of two languages). An individual's proficiency in each language will typically vary across the four language competences of speaking, listening, reading and writing. A person who understands a second language well, in its spoken and/or written form, but does not speak or write it well is termed a **passive bilingual** or is said to have **receptive competence** in a second language.

In contrast, a person who speaks and/or writes in both languages is termed an **active bilingual**.

Few bilinguals are equally competent in both languages, with one language often the **dominant language.** However, the dominant language can change across time, context and function. It is not always the first or native language of the bilingual (e.g., immigrants who need to operate almost solely in the host country's dominant language). Thus degree and function are not separate.

Bilinguals do not usually possess the same proficiency as monolingual speakers in either of their languages. Levels of proficiency in a language relate, in part, to which **domains** (e.g., family, work, school, religion, mass media usage) and how often that language is used. **Communicative competence** in one of a bilingual's two languages is usually stronger in some domains than in others. This partly explains why many bilinguals are not expert at interpretation and translation as most do not have identical lexical knowledge in both languages.

A distinction between a **second language learner** and a bilingual is arbitrary and artificial. There are a series of dimensions such that classification is dependent on self-attribution and other attribution as much as ability in languages. That is, labels can be dependent on perception as much as proficiency. Any language learner is an incipient bilingual. Any bilingual is or was a language learner or language acquirer.

A much contested type of bilingual is a 'semilingual' or '**double semilingual**', regarded as having 'insufficient' proficiency in either language. Such a person is considered to possess a small vocabulary and incorrect grammar, consciously thinks about language production, is stilted and uncreative with both languages, and finds it difficult to think and express emotions in either language – particularly when monolinguals are seen as the benchmark.

The concept of double semilingualism among bilinguals has received much criticism (e.g., Skutnabb-Kangas 2000). The danger of the term 'semilingualism' is that it locates the origins of underdevelopment in the individual rather than in external, societal factors (e.g., poverty) that coexist with bilingualism and fails to take account of the contextual nature of the use of two (or more) languages. For example, one language may be fluently used in the extended family and networks of friends but does not have the register needed for schoolwork or a profession. A second language may thus be proficiently used at school or in the workplace, but rarely at home. When a person has a low level of proficiency in both languages (a rare occurrence) this is usually a result of social and economic circumstances and does not relate to any limits of a bilingual's linguistic or cognitive potential.

The portrayal of bilinguals as double semilinguals symbolises that, until recently, bilinguals have often been wrongly portrayed (e.g., as having a split identity, cognitive deficits). Part of this is political (e.g., prejudice against immigrants; majority language groups asserting their greater power, status and economic ascendancy; those in power wanting social and political cohesion around monolingualism and monoculturalism).

However, the portrayal of bilinguals varies internationally. In some countries (e.g., India, parts of Africa and Asia), it is normal to be **multilingual** (e.g., in a national language, an international language and one or more local languages). In other countries, many bilinguals may be immigrants and seen (e.g., by some politicians) as causing economic, social and cultural challenges to the dominant majority. Where **indigenous language minorities** exist (e.g., Basques in Spain, Maori in New Zealand, Welsh speakers in Wales), more recognition has sometimes been accorded to such groups following the movement away from nationalism towards an 'ethnic revival' (Fishman 1999). With both immigrant and indigenous minorities, the term 'minority' is decreasingly defined in terms of smaller numbers in the population and increasingly as a language of low prestige and low in power relative to the majority language. This indicates that bilinguals are most frequently found in lower-status groups, although there are also increasing numbers of 'elite' bilinguals – those who use two or more majority languages (e.g., Spanish and English) as globalism increases.

Cook (1992) and Grosjean (2001) suggest two contrasting views of bilinguals: one about separation, the other about 'wholeness'. The **fractional view** of bilinguals sees the individual as two monolinguals in one person. For example, if English is the second language,

scores on English tests will typically be compared against native monolingual Anglophone norms.

One consequence of the fractional view is to limit the definition of bilingualism to those who are approximately equally fluent in both languages, with proficiency comparable to a monolingual. If that competence does not exist in both languages, especially in the majority language, then bilinguals may be denigrated and classed as inferior. In the USA, for example, children of language minority families may be classified as LEP (Limited English Proficient). The monolingual is seen as normal, and the bilingual as an exception or oddity. This monolingual view often wrongly predicts negative consequences in cognitive processing, because of the perceived potential confusion between two underdeveloped languages (Baker 2006).

Many bilinguals feel themselves insufficiently competent in one or both of their languages compared with monolinguals, accepting and reinforcing the monolingual view of bilinguals. A bilingual may apologise to monolinguals for not speaking their language as well as they do.

Yet the bilingual is a complete linguistic entity, an integrated whole. Thus Grosjean (2001) presents an alternative and positive '**holistic view**'. In athletics, could we fairly judge a sprinter or high jumper against a hurdler? The sprinter and high jumper concentrate on excellence in one event. The hurdler develops two different skills, trying to combine a high standard in both. The hurdler may be unable to sprint as fast as the sprinter or jump as high as the high jumper. This is not to say that the hurdler is an inferior athlete to the other two. Any such comparison makes little sense. Comparing the language proficiency of a monolingual with a bilingual's dual or multiple language proficiency is similarly seen as unjust.

Yet the political reality in many countries is that bilinguals are measured and compared by reference to monolinguals. When someone learns English as a second language, should that competence in English be measured against monolinguals rather than other bilinguals? In countries like the USA, where first language Spanish-speaking children have to compete against monolingual English-speakers in an English language job market, a politically dominant view is that they should face the same English assessments in school. In Australia, most of Canada, the USA and the UK, dominant English-speaking politicians and administrators will usually not accept a different approach or standard of assessment (one for monolinguals, another for bilinguals).

The fractional and holistic viewpoints parallel ongoing research on the representation and storage of language in the bilingual brain. One issue has been whether a bilingual's two languages function independently or interdependently. Early research attempted to show that early bilinguals (**compound bilinguals**) were more likely to show interconnections and interrelatedness in their two languages than late (**coordinate**) bilinguals. More recently, this has been redefined in terms of memory storage and functioning in the bilingual brain. A **separate storage** idea suggests that bilinguals have two independent language storage and retrieval systems with the only channel of communication being a translation process between the two separate systems. A **shared storage** idea argues that the two languages are kept in a single memory store with two different language input channels and two different language output channels. Evidence exists for both independence and interdependence (Bialystok 2001). Lexical representations for each language are separately stored by a bilingual, while the conceptual representations are shared. There is also general agreement that both languages remain active when just one of them is being used. Also, while there are shared conceptual representations and both languages are active in bilinguals, functionally the languages stay independent (e.g., when speaking, reading, writing).

Some children acquire two first languages from birth. This is called **simultaneous bilingualism** or 'bilingualism as a first language' as different from consecutive, sequential or successive bilingualism which results from the initial acquisition of a mother tongue plus informal or formal second language learning in later years. This distinction hides some conceptual simplicity in terminology. For example, the term '**first language**' is used in different, overlapping ways, and can mean (a) the first language learnt; (b) the stronger language; (c) the 'mother tongue'; (d) the language most used. '**Mother tongue**' is also used ambiguously. It variously

means (a) the language learnt from the mother; (b) the first language learnt, irrespective of 'from whom'; (c) the stronger language at any time of life; (d) the 'mother tongue' of the area or country (e.g., Irish in Ireland); (e) the language most used by a person; (f) the language to which a person has the more positive attitude and affection.

Multilingualism

The word 'bilingual' historically served as an umbrella term for the many people who have varying degrees of proficiency in three or more languages. However, '**multilingualism**' is more appropriate. In many parts of the Indian, African and Asian continents, several languages coexist, and large sections of the population speak two or three or more languages. In such countries, individual multilingualism is often the result of a process of industrial development, political unification, modernisation, urbanisation and greater contact between different local communities. Many individuals speak one or more local languages, as well as another indigenous language, which has become the medium of communication between different ethnic groups or speech communities. Such individuals may also speak a colonial or international language such as English, French or Spanish. This latter language may be the vehicle of education, bureaucracy and privilege.

In many Western countries, individual **monolingualism** rather than multilingualism has been the desired norm (e.g., France, England, USA, the old USSR). This has often been the result of a drive toward political and national unification, which required the establishment of an official language or languages to be used in education, work and public life. However, in Western countries where there are indigenous minorities (e.g., the Catalans and Basques in Spain) or many immigrants (e.g., Canada), bilingualism and multilingualism are often present and valued. In the Asian communities of Britain and Canada, some individuals are trilingual, in their '**heritage language**', in another Asian language often associated with literacy (such as Urdu or Hindi) and in English. In addition, a Muslim child will learn Arabic, the language of the Qur'an and the Mosque.

Multilingualism also occurs among individuals who do not live in a multilingual community. Families can be trilingual when the husband and wife each speak different languages to their children which are different from the majority language of the school and the country of residence. A person can also learn multiple languages at school or university, at work, or in leisure hours. The motives for such language learning include personal enrichment, travel, educational betterment and employment advantages. Such '**elite multilingualism**' is usually voluntary and planned, frequently bringing economic, educational and social advantages. Both **integrative** and **instrumental** motivations may be at work. Where the native tongue is not an international, high-prestige language in a country, the inhabitants may be particularly conscious of the economic, employment and travel value of multilingualism.

Many mainland European children learn two languages in school, such as English, German or French, as well as being fluent in their home language, for example, Finnish, Swedish, Danish, Luxembourgish or Dutch. In parts of Scandinavia, many people seem particularly successful in trilingualism. The economic, employment and travel value of speaking several languages is a major explanation of this Scandinavian multilingual accomplishment, aided by school systems that place a relatively high premium on classroom language learning.

Individual multilingualism is thus possible, non-problematic and potentially valuable. Human beings have the brain capacity to learn and retain several languages. However, different languages serve different purposes for most multilingual people. The multilingual typically does not possess the same level or type of proficiency in each language.

Languages within a multilingual individual tend to develop or decay over time. One or two of them may become stronger, another may weaken. This is even truer of multilinguals than of bilinguals. As opportunities for practice vary and motivations change, so may language dominance. Few individuals live in a situation that allows regular use of their three or more languages over a lifetime. The coexistence of multiple languages will shift within an individual or family, according to religious, cultural, social,

economic, political and community pressures. A person's languages are surrounded by 'market forces', external manipulation and internal motivations, genuine encouragement and active hostility.

Codeswitching

Codeswitching is a change of language within a conversation, usually when bilinguals are with other bilinguals. Codeswitching can occur in large blocks of speech, between or within 'sentences', even involving single words or phrases. Various terms have been used to describe switches between languages in bilingual conversation. **Codemixing** has been used to describe changes at the word level, when one or two words change in a sentence. However, 'codeswitching' is now generally used for any switch within the course of a single conversation, whether at the level of word, sentence, or blocks of speech.

Language borrowing indicates foreign loan words or phrases that have become an integral and permanent part of the recipient language. '*Le weekend*' in French, '*der Computer*' in German are examples. All languages borrow words or phrases from others with which they come in contact. Codeswitching may often be the first step in this process. As these elements are widely used, they become accepted and perceived as part of the recipient language. Some linguists have tried to distinguish between '**nonce borrowings**' (one-time borrowings, as in codeswitching) and **established borrowings**. Myers-Scotton (1992) argues against distinctions between codeswitches and loans, as they form a continuum, rather than two distinct and separate entities.

Codeswitching does not happen at random. Underneath is a communicatively efficient, uniform, rule-bound linguistic strategy. It is using the full language resources that are available to a bilingual, usually knowing that the listener understands the codeswitches. One language (called the **matrix language**) provides the grammatical frame or rules for grammar (Myers-Scotton 2002). Codeswitching involves a consistent (e.g., word order, verb endings) use of the secondary language, as the second language insertions will fit those matrix language rules.

Monolinguals who hear bilinguals codeswitch may view it negatively, believing it shows a deficit in mastery of both languages. Bilinguals themselves may be defensive or apologetic, and attribute codeswitching to careless language habits. However, it tends to be those who are more fluent in a language that codeswitch (Meisel 2004). Bilinguals often operate along a dimension from monolingual speech acts to frequent codeswitching with similar bilinguals, with many possibilities between these two.

Grosjean (1992) distinguishes between the 'monolingual mode' when bilinguals use one language with monolingual speakers of that language, and the 'bilingual mode' when bilinguals are together and have the option of codeswitching. In the 'monolingual mode' bilinguals may occasionally mix languages. Often the dominant language influences the less dominant. Such influence was called **interference**, although the term **transfer** is sometimes preferred.

Grosjean (1992) also differentiates **static** and **dynamic interference**. Static interference describes the relatively permanent influence from one of the bilingual's languages on the other. Accent, intonation and the pronunciation of individual sounds are common areas where static interference may be present. A native German speaker speaking English with a German intonation may pronounce various sounds in a 'German' way, such as hardening soft consonants at the end of words ('haf' for 'have', 'goot' instead of 'good'). Dynamic interference recognises that features from one language are transferred temporarily into the other. This can occur in syntax, phonology or vocabulary, and in both written and spoken language. For example, an English speaker with some competence in French may show dynamic interference by using the word *librairie* to mean 'library', whereas it means 'bookshop'.

Many bilinguals find the term 'interference' negative and pejorative, revealing a monolingual, 'fractional' perspective. Switching between languages may serve to convey thoughts and ideas in the most personally efficient manner. A person may realise that the listener understands such switching. When bilinguals interact among themselves, they are in a bilingual language mode, where both languages are activated and the resources of both are available.

In many bilingual situations throughout the world, codeswitching between two languages has become the norm. Among Wolof–French bilinguals in Dakar, Hindi and English bilinguals in parts of India, Spanish–English Puerto-Ricans in areas of New York, for example, there is an acceptable mixing of two languages. Such codeswitching is a symbol in itself of belonging to a mixed group with a multiple identity.

In some other bilingual communities, separation of languages can be the acceptable norm, for political, cultural or social reasons. In cases of power conflict between ethnic groups, language may be a prime marker of a separate identity. Codeswitching is then much less acceptable. For example, French–English codeswitching is unacceptable among some Canadian francophone groups, because of their power and ethnic identity struggle with anglophones. Treffers-Daller (1992) illustrates how French–Flemish codeswitching in the Belgian capital, Brussels, was acceptable to the older bilingual generation, who identified with both the French and Flemish groups. It has become less acceptable, however, among younger Belgians, because of the gradual polarisation of the Walloon and Flemish ethnic groups.

The uses of codeswitching

Social and psychological factors, rather than linguistic ones, trigger codeswitching. Codeswitches have a variety of purposes and aims and change according to who is talking, the topic, and the context of the conversation (Baker 2006; Myers-Scotton 1993).

Codeswitches may be used to emphasise a particular word or phrase or its central function in a sentence.

When a speaker does not know a word or phrase in one language, another language may be substituted. This often happens because bilinguals use different languages in different domains of their lives. An adult may codeswitch to discuss work, because the technical terms associated with work are only known in that language.

Bilinguals may switch languages to express a concept without an equivalent in the culture of the other language. A French–English bilingual living in Britain may use words like 'pub' and 'bingo hall' in French, because these words have no French equivalent. As previously stated, such words and phrases are called 'loans' or 'borrowings' when they become established and in frequent use in the other language. However, there is no clear distinction between a codeswitch and a borrowing.

Codeswitching may reinforce a request. For example, a teacher repeats a command to emphasise it: *Taisez-vous*, *les enfants!* Be quiet, children! In a majority/minority language situation, the majority language may emphasise authority. A Spanish-speaking mother in San Francisco may use English with her children for short commands like 'Stop it! Don't do that!' and then return to Spanish.

Repetition of a phrase or passage in another language may also clarify a point. Some teachers explain a concept in one language then explain it again in another, believing that repetition adds reinforcement of learning and aids understanding.

Codeswitching may communicate friendship or family bonding. Moving from the common majority language to a minority language both the speaker and listener understand well, may communicate common identity and friendship. Also, the use of the listener's stronger language may indicate deference.

In relating an earlier conversation, the speaker may report it in the language(s) used. Two people may be speaking Panjabi. When one reports a previous conversation with an English speaker, the conversation is reported authentically in English, as it occurred.

Codeswitching is a way of interjecting into a conversation. A person attempting to break into a conversation may introduce a different language. Changing languages may signal interruption, with the message 'I would like to join this conversation'.

Codeswitching may ease tension and inject humour into a conversation. If committee discussions become tense, the use of a second language can signal a change in the 'tune being played'. Just as in an orchestra, where different instruments in a composition may signal a change of mood and pace, a language switch may indicate a change of mood within the conversation.

Codeswitching often reflects a change of attitude or relationship. When two people meet, they may use the common majority language. As

the conversation proceeds and roles, status and ethnic identity are revealed, a change to a regional language may indicate the crossing of boundaries. A codeswitch signals lessening of social distance, with growing solidarity and rapport.

Conversely, a change from minority language or dialect to majority language may indicate the speaker's wish to elevate status, create a distance from the listener, or establish a more formal, business relationship.

Codeswitching can also exclude people from a conversation. When travelling on the subway (metro, underground), two people may switch from English to their minority language to talk about private matters.

In some situations, codeswitching occurs regularly when certain topics are introduced. For example, Spanish–English bilinguals in the southwestern USA may switch to English to discuss money. This reflects the fact that English is the language of commerce and often the dominant language of the mathematics curriculum.

Familiarity, projected status, the ethos of the context and the perceived linguistic skills of the listeners affect the nature and process of codeswitching. Codeswitching is not 'just' linguistic; it indicates important social and power relationships.

Bilingual children and families

The future of the world's approximately 6,000 languages, which are declining rapidly in number, is tied closely to family, school and economic influence. Unless families reproduce minority languages at home, then **bilingual** (**diglossic**) **communities** are in danger of fast diminution. **Language transmission** in the family is an essential but insufficient condition for **language preservation**.

The term **bilingual family** encompasses an almost infinite variety of situations and is difficult to define simply. Each bilingual family has its own patterns of dual language use, and relation to the local community. A profile of such families involves: the language(s) spoken between parents, by the parent(s) to the children, by the children to the parent(s), between the children, the language(s) spoken or understood by the nearby extended family and the local community or network of friends, the language of education and religious observance, the official or majority language(s) of the state or country, and the family's geographical stability or mobility. These factors influence the nature and level of bilingualism within an individual family. They also indicate the difficulty of neatly categorising bilingual families, illustrated below.

Bilingualism is not always homegrown. A bilingual or multilingual family may speak more than one language, but use only one language, often a minority language, inside the home, while acquiring the dominant language of the community outside the home.

Not every individual in a bilingual family is bilingual. One parent may be bilingual and decide to speak a native language to the children, while the other parent may only speak the dominant language of the local community, as in a UK family with a Bengali-speaking mother and monolingual English-speaking father.

Monolingual parents may have bilingual children, while bilingual parents may raise monolinguals. Many first-generation immigrants develop a limited command of the majority language of the host country. Their children learn the majority language at school and on the streets. Alternatively, parents who speak one language of a country may have their children educated in a second majority language, or a heritage minority language. For example, in Canada, some anglophone parents choose French immersion education so their children may benefit from bilingualism in both Canadian majority languages.

The opposite can happen. Minority language parents may have negative attitudes toward their language and raise their children in the majority language. Many immigrant families progress within a few generations from monolingualism in the minority language to bilingualism in both majority and minority languages, then monolingualism in the majority language. Sometimes termed **three generational shift**, this happened with many immigrants to the USA and continues to occur in many parts of the world today.

There may be different degrees of bilingualism within families. Within bilingual families, language dominance and competence may vary among members and over time. Where parents speak a minority language to their children, and where the school and community share the

dominant, majority language, the children may have only passive competence in the minority language. In immigrant communities, parents may have only limited command of the majority language, while children eventually become dominant in it. Moving to another area or country or switching to a minority (or majority) language school for the children may mean a change in the family language balance.

Types of family bilingualism

There are a variety of types of family bilingualism based on parental language strategies in raising children bilingually (Baker 2007). The one strategy most covered in the literature is the **'one person – one language' family (OPOL)**. The parents have different native languages, and each speak their own language to the child from birth. Literature on child bilingualism celebrates this strategy as a highly effective path to bilingualism believing that there is rich experience in both languages. Also, this OPOL strategy has been praised because it helps the young child keep the two languages separate. De Houwer (1995) loosened this orthodoxy, arguing that complete separation is an ideal rather than a reality, and that case histories show that when one parent uses both languages, the child still communicates effectively in both.

Recent research has found that bilingual children (two years old or earlier) know which language to speak 'to whom' and in 'what situation' (Deuchar and Quay 2000). Very young children easily switch languages and differentiate their two languages, but there is individual variation (De Houwer 2006). The ability to use the appropriate language with a particular person occurs very early. Genesee et al. (1996) found that 'appropriate language matching' is found in two year olds from bilingual homes when talking to strangers. Children rapidly and accurately accommodated the monolingualism or bilingualism of a stranger and talked in the appropriate language.

Other types of bilingual family vary around the following dimensions: whether the parents speak the same or different language to the child; whether those languages are majority or minority languages; whether one is the dominant community language, or whether the child learns the dominant language outside the home, particularly through education. Most 'types' assume a stable bilingual environment and a commitment to bilingualism. However, in many families, bilingualism is in a state of development or decline, often reflecting the state of bilingualism in the wider speech community.

Contexts in the development of bilinguals

The societal context where children are raised is likely to have an effect on language life within the person. In a **submersion** or **transitional bilingual situation**, the introduction of a second language detracts from the child's developing skills in the first language. The second language is acquired at the expense of the first language. The first language skills fail to develop fully, yet the child struggles to acquire the second language skills needed to cope in the classroom.

Some children survive and succeed in this **subtractive environment**. For many others, this situation initiates a pattern of failure throughout their school career. International research (see Baker 2006 for a review) suggests that minority language children succeed better when they are taught initially through their home language. Here the child's skills are valued and built upon. Later, when the majority language is gradually introduced, the academic skills and knowledge acquired through the first language transfer easily to the second (Cummins 2000).

For majority-language children, the situation is different. Some parents, wishing their children to become bilingual, send them to dual language schools, where two languages are used to teach content (e.g., mathematics, social studies), or to a heritage language school, where teaching is mostly through the medium of a minority language. Majority-language children usually cope well in the curriculum in a second language. Their home language and culture have status and prestige and will not be supplanted or eroded.

Bilingual education

Bilingual education would seem to describe a situation where two languages are used in a school. However, 'bilingual education' is a simple label for a diverse phenomenon. One important

distinction is between a school where there are bilingual children and a school that promotes bilingualism. In many schools of the world, there are bilingual and multilingual children. Yet the aim of the school may be to ensure that children develop in one language only. For example, a child may come to school speaking a minority language fluently but not the majority language. The school may aim to make that child fluent and literate in the majority language only, with integration and assimilation of that child into mainstream society.

Such 'weak' forms of bilingual education aim for a transition from the home culture and language to the majority culture and language. **'Weak' bilingual education** occurs when children are only allowed to use their home language in the curriculum for a short period, with a transition to education solely through majority language. **'Strong' bilingual education** occurs when both languages are used in school to promote bilingualism and **biliteracy**. For example, in **heritage language schools**, children may receive much of their instruction in the home language, with the minority language being used to transmit 20 per cent to 90 per cent of the curriculum. Alternatively, a child from a majority language background may go to an **immersion school** (e.g., Canada, Finland), **dual language school** (USA) or a mainstream bilingual school and learn through a second majority (or minority) language.

There are also trilingual and multilingual schools (Mejia 2002), where three or more languages are used (e.g., in the European Schools Movement, or Luxembourgish/German/French education in Luxembourg, or Hebrew/English/French in Canada, or Basque/Spanish/English in the Basque Country).

Societal bilingualism

Bilinguals typically live in networks, communities and societies which take on particular social characteristics. The distinction between **additive** and **subtractive bilingualism** indicates that bilingual communities differ. When the addition of a second language and culture is unlikely to replace or displace the first language and culture, the bilingual situation is additive. English-speaking North Americans who learn French or Spanish will not lose English, but gain a second language and parts of its culture. The 'value added' benefits are social and economic as well as linguistic and cultural. Positive attitudes about bilingualism may also result.

In contrast, the learning of a majority second language may undermine a minority first language and culture, thus creating a subtractive situation (e.g., many Asians in the UK and Latinos in the USA). Immigrants may experience pressure to use the dominant language and feel embarrassed to use the home language. When the second language is prestigious and powerful, used exclusively in education and employment, while the minority language is perceived as low in status and value, there is subtraction with the potential loss of the second language.

With little or no pressure to replace or reduce a first language, the acquisition of a second language and culture occurs as an additive form of bilingualism. When the second language and culture are acquired with pressure to replace or demote the first, as with immigrants, a subtractive form occurs, loss of cultural identity, possible alienation and cultural assimilation.

Diglossia

'Bilingualism' typically serves to describe an individual's two languages. When the focus changes to two language varieties coexisting in society, a common term is **diglossia** (Ferguson 1959; Fishman 1980). In practice, a community is unlikely to use both language varieties for the same purposes, although much overlap can occur. It is likely that one language is used in certain contexts and for particular functions, and the other language used in different situations. For example, a language community may use its heritage, minority language in the home, for religious devotions and in social activity. The majority language may be used at work, in education and when accessing the mass media.

Ferguson (1959) first defined diglossia as the use of two divergent varieties of the same language for different societal functions. Fishman (1980) extended the idea to two languages existing side by side within a geographical area. In both situations, different languages or varieties may serve varied purposes and be used in different situations with the low (L) variety or

minority language more frequent in informal, personal situations and the high (H), majority language in formal, official communication contexts.

Different contexts usually make one language more prestigious than the other. Because the majority language is used for prestigious functions, it may seem superior, more elegant and more cultured, the door to both educational and economic success. On the other hand, the 'low variety' is often restricted to interpersonal, domestic functions, and may seem inferior, inadequate, and low class.

Diglossia and bilingualism

Fishman (1980) combined the terms 'bilingualism' and 'diglossia' to characterise four language situations where bilingualism and diglossia may exist with or without each other. The first situation is where most people use both the high language variety and the low language variety but for a separate set of functions. This tends to lead to relatively stable bilingualism.

The second situation is diglossia without bilingualism within a particular region. One group of people will speak one language, another group a different language. In some cases, the ruling power group will speak the high variety, with the larger less powerful group speaking only the low variety. Fluent bilingual speakers of both languages may be few, as in the past in some colonial situations.

The third situation is where most people will be bilingual and will not restrict one language to a specific set of functions. Either language may be used for almost any purpose. Fishman (1980) regards such communities as unstable and believes that one language will, in the future, become more powerful and have increasing purpose and domain-control. The other language may decrease in its functions and decay in status and usage.

The fourth situation is where there is neither bilingualism nor diglossia, that is where monolingualism is the norm (e.g., Cuba and the Dominican Republic where the indigenous languages were eradicated and where there is little immigration).

A problem with diglossia is that the reasons for the distribution of two or more languages across domains are left unexplained. A full understanding of a diglossic situation requires an historical analysis of socio-economic, socio-cultural development within geographical areas. That is, by itself diglossia and the concept of the domains are in danger of providing descriptions rather than explanations; a static picture rather than an evolutionary explanation, where differences in power and histories of political change are hidden.

C. B.

Suggestions for further reading

Baker, C. (2006) *Foundations of Bilingual Education and Bilingualism*, 4th edn, Clevedon: Multilingual Matters.

Cummins, J. (2000) *Language, Power and Pedagogy: Bilingual Children in the Crossfire*, Clevedon: Multilingual Matters.

Garcia, O. and Baker, C. (2007) *Bilingual Education: An Introductory Reader*, Clevedon: Multilingual Matters.

C

Cognitive linguistics

Introduction: cognitive linguistics as a new paradigm in linguistics

Cognitive linguistics (CL) started as a new linguistic paradigm in the late 1970s. In contrast to structuralist and generative predecessors, CL sees language, not as an independent, self-sufficient system, but as a faculty integrated with other cognitive abilities such as perception, memory, attention, imagination, emotion, reasoning, etc. CL's main focus is on the pairing of form and meaning. Linguistic meaning is not an autonomous system in the mind, but part and parcel of our conceptual world. CL has broken away from the traditional Aristotelian belief in classical definitions of conceptual categories and from any form of objectivist realism, which, in contrast to the phenomenologist revolution of Husserl or Merleau-Ponty (1945, 1979), accepts the existence of a mind-independent reality and the possibility of stating absolute truths. In contrast, CL adopts an experientialist realism (Lakoff and Johnson 1980: 181; 1999) and a phenomenologist outlook (Geeraerts 1985: 355; 1993) as its philosophical basis: all individuals have access to the world by their bodily experiences of that world (**experientialism**), and their embodied relations to the world including other humans is simultaneously a conscious and intentional one (**phenomenology**). As a linguistic theory, CL has given up all traditional Saussurean and second-generation **structuralist axioms** reducing language to a self-sufficient system, especially dichotomies such as *langue* vs. *parole*, synchrony vs. diachrony, syntax vs. semantics, lexis vs. grammar, etc. The claim of the arbitrariness of the linguistic sign is largely replaced by a search for motivation of linguistic organisation by cognitive principles of iconicity, salience and relevance. In contrast to **generative linguistics** [*see* GENERATIVE GRAMMAR], which sees language as an autonomous system, detached in principle from any other type of knowledge, especially encyclopedic knowledge, CL holds that there is no clear-cut distinction between linguistic and encyclopedic knowledge (Haiman 1980). As Goldberg (1995: 5) puts it, 'knowledge of language is knowledge', just like any other type of knowledge, one could add.

Historically speaking, CL belongs to the functionalist tradition. Although Saussure (1916/1974) saw linguistics as part of semiology or semiotics, he mainly emphasised one semiotic principle, i.e. **symbolicity**, as the organising principle of linguistic structure. In a more balanced semiotic view of language (e.g., Haiman 1985, 1986) the two other, more perceptually and experientially based, **semiotic principles**, i.e. iconicity and indexicality, are shown to be highly relevant, too. As a direct manifestation of the interaction between perception and language, the **principle of iconicity** becomes visible in three **subprinciples of linguistic organisation**, i.e. sequential order, proximity or distance, and quantity. The **principle of sequential order** says that the order of the phenomena in our perceived or conceived world is reflected at all levels of linguistic structure. At discourse level, Caesar's proclamation *veni*, *vidi*, *vici* reflects the temporal succession of these historical events. The same holds in advertising strategies such as *Eye it, try it, buy it*. The **principle of proximity**, or distance, says that what belongs together

conceptually, tends to stay together syntactically, and vice versa. Thus the order in the adjective sequence *a large purple satin coverlet* reflects the primacy of material over colour over size in the intrinsic nature of artefacts. **The principle of quantity** relates to the pairing of form and meaning and says that more form tends to imply more meaning. This may be dictated by functional factors such as politeness, demands of informativeness, rhetoric, etc. All these principles thus reveal that extralinguistic factors and knowledge of them may have a direct bearing on linguistic form, or that linguistic form is not arbitrary. Although CL does not strictly separate semantics and grammar as distinct areas of language, some strands in CL more strongly emphasise lexical-semantic units, whereas others rather concentrate on grammatical units.

Cognitive semantics

Prototype theory and categorisation

The pairing of form and meaning can take shape at any level of linguistic organisation, be it lexical, syntactic such as plural formation, or constructional, as will be seen later. At all these levels, meaning is a question of conceptual categorisation. Recently, views of categorisation have changed radically. The Aristotelian belief in 'classical definitions' for categories assumes that all members of a category, e.g., the category *fruit*, share some essential feature(s), that all category members have equivalent status as members, and that category boundaries are clear-cut. Suppose that for the category *fruit* characteristics such as *sweet*, *soft* and *having seeds* are necessary and sufficient features. In this case several types of fruits would remain outside the category: lemons, because they are not sweet, avocados, because they are not necessarily soft, and bananas, because they have no seeds. Strawberries are more like rhubarb because both grow on the ground, not on bushes or trees. Are they fruits? Why is a strawberry a fruit, while rhubarb is not? All this fuzziness within or between categories suggests the necessity of a different approach, such as, for instance, the **prototype view of categorisation** (Rosch 1973, 1977, 1978; Berlin and Kay 1969; Lakoff 1987a; Geeraerts 1989), which holds that categories do not reflect 'objective' assemblies of features, but rather are man-made approximations consisting of clear, central or 'prototypical' members such as *apples*, *pears* and *oranges* for the category *fruit*, and less central or even marginal members such as *avocados*, *lemons* and *strawberries*. Hence, members of a category do not have equivalent status, and category boundaries are not clear-cut (*nuts* grow on trees, but do not share any of the three basic features). Categories are to some extent also based on 'family resemblances' as shown by Wittgenstein (1953) for the German category *Spiele* 'games', which contains such diverse members as children's games, a football match, a theatre play, and even gambling. There is also psychological evidence for prototype effects in categorisation. Statements about central members of a category are processed far more quickly than statements about marginal members, and reasoning about any category is based on what is known about good examples of the category (Rosch 1978).

Polysemy and semantic flexibility

In the conceptual world, every category is hierarchically linked to some other categories by hyponymy or hyperonymy, but for the rest it stands on its own as a separate entity. In contrast to this, various linguistic categories, that is, categories laid down in language, are often linked to one form only, as illustrated for *fruit* and German *Spiele*. As a rule, a linguistics form tends to be polysemous and stand for various meanings or conceptual categories. Still, in linguistic theorising there is a huge cleft between monosemist and polysemist views of meaning. Generative linguists (e.g., Bierwisch and Schreuder 1992) tend to subscribe to a **monosemist view**, according to which words have only one basic meaning and the different applications to various entities in the world are managed via an interface between language and thought (cf. Taylor 1995b). This may work nicely for words expressing manmade or artifactual entities such as *university*, which can refer to a building, an institution for learning and research, a period of time in a person's life, a qualification, etc. But things are far more complicated in the case of words denoting natural entities such as *fruit*. In its prototypical use, $fruit_1$ refers to 'something

such as an apple, banana, or strawberry that grows on a tree or other plant and tastes sweet' (Oxford Advance Learners Dictionary of Current English, *LDCE*). In this sense we can oppose *fruit*$_1$ to *vegetables*, e.g., *fresh fruit and vegetables*. But in a technical sense, *fruit*$_2$ is 'the part of a plant, bush, or tree that contains the seeds' (*LDCE*). In this sense, *potatoes* and all other root crop are fruits. Obviously, these two senses of one word form are mutually exclusive. *Fruit*$_2$ is an instance of what is known as specialisation. Each linguistic form can undergo four different cognitive processes of meaning extension, i.e. **generalisation**, **specialisation**, **metaphor**, and **metonymy**. Thus the meaning of *fruit*$_3$, i.e. 'all the natural things that the earth produces such as fruit, vegetables or minerals' (*LDCE*) is an instance of generalisation. **Metaphorical extension** has applied to *fruit*$_4$ as in *the fruits of one's work*, meaning 'the good results from working very hard' (*LDCE*). Although the four conceptual categories designated by the same word form are independent of one another, the human conceptualiser may see similarities and extend the use of this form from one to several categories. The four senses of *fruit* have been systematically related by the various cognitive processes discussed so far. *Fruit*$_1$ is the prototypical sense. *Fruit*$_2$ is a more specialised term, only applicable to anything carrying or counting as seeds, hence also to grains, nuts, roots, tubes, etc. *Fruit*$_3$ is a more abstract generalisation, including minerals. *Fruit*$_4$ applies metaphorically to the abstract domain of the results of human endeavour. These four senses are clearly interrelated and can be represented in a radial network (see Dirven and Verspoor 2004: 35ff.), in which the conceptual links between the various senses of a polysemous linguistic unit are conceptually interlinked. However, the psychological reality of this type of semantic network is questionable (Sandra and Rice 1995). More generally, at present there are strong tendencies in CL towards an even more context-dependent view of lexical and grammatical meaning and an extreme flexibility of lexical meaning (see Cuyckens et al. 2003). Also new is the interest in the corpus-accessed collocational structure of words and the highly idiomatic and formulaic nature of language in use (Stefanowitsch and Gries 2003, 2006).

Metaphor and the conceptual leap

The perceptual system of humans is based on a number of pre-conceptual, most of all spatial, **image schemata**, which allow them to react to, and manipulate, the world. These pre-conceptual configurations encompass sensory-motor and visual schemata such as motion, containment, contact, support, blockage, verticality, proximity-distance, etc. (Johnson 1987). As the human mind and language develop, these pre-conceptual or bodily image schemata serve as the basis for categorising phenomena in the physical domain and, by means of metaphorical mapping, for categorising experiences in the more abstract mental domain. Lakoff and Johnson (1980) claim that metaphors are not primarily a matter of language, but a matter of thought. The metaphorical mind seizes upon the domains of spatial and concrete categories as **source domains** and, by means of metaphor, 'transfers' or maps source domains such as heat, motion or journey onto less concrete and abstract domains such as emotion, time, event structure, causality, etc. Thus we tend to conceptualise the emotion of anger as fire via the conceptual metaphor (hence in small capitals), LOVE IS A HOT FLUID IN A CONTAINER, which may be expressed in various linguistic metaphors as in *My blood was boiling*, *He was seething with anger*, *He blew his top*. Time is experienced as motion, either as TIME IS A MOVING OBJECT (*The years flew by*) or as TIME IS A BOUNDED REGION FOR A MOVING OBSERVER (*We are coming up to Christmas*). The **complex event structure metaphor** consists of various subtypes such as states, changes of state, causes, actions, purposes, means, difficulties. All of these are conceptualised in spatial image schemata: STATES ARE LOCATIONS (*be in doubt*), CHANGE OF STATE IS CHANGE OF LOCATION (*get into trouble*), ACTION IS SELF-PROPELLED MOTION, PURPOSES (OF ACTION) ARE DESTINATIONS, MEANS ARE PATHS (TO DESTINATIONS) and DIFFICULTIES ARE IMPEDIMENTS TO MOTION. Lakoff's claim is that such basic conceptual metaphors may well be universal since human bodily experience is basically the same all over the world. Although this claim receives substantial support in Ning Yu (1998), it must also be further refined. Yu shows that the three domains of emotion, time and event structure are conceptualised both in

English and Chinese by means of the same conceptual metaphors, but Chinese does so in a far more concrete way and against a different conception of the body. Thus, Chinese conceptualises love as a hot gaseous substance present in many internal organs, under each of which a fire is burning. As Yu (2009) shows, this conception of the body, its parts and their functioning is heavily impregnated by traditional Chinese philosophy and medicine.

Embodied realism and its phenomenologist depth

CL, as Lakoff, Johnson and many others see it, is a challenge to traditional Western thought, ranging from Aristotle to Descartes, as well as to many philosophical assumptions underlying linguistic theories such as most structuralist schools and Chomsky's generative grammar [*see* GENERATIVE GRAMMAR]. However, CL is equally part of and deeply rooted in this Western tradition, as several CL critics of Lakoff and Johnson claim (e.g., Geeraerts 1985, 1993; Jäkel 1999; Haser 2005; Prandi 2006; Frank et al. 2007; Ziemke et al. 2007). According to Lakoff, traditional Western thought is based on **objectivist realism**, for which 'true knowledge of the external world can only be achieved if the system of symbols we use in thinking can accurately represent the external world' (Lakoff 1987a: 183). The alternative view of the world, according to Lakoff, is **embodied realism**. This theory holds that 'human language and thought are structured by, and bound to, an embodied experience' (Lakoff and Johnson 1999: 233). Perceptual, especially spatial, experience paves the way for categorisation, and, as illustrated in the previous section, these concrete domains are mapped by metaphorical projection onto abstract domains. It does not come as a surprise then that so many domains of life, including biology and economics, religion and science, philosophy and metaphysics, are explored and conceptualised at a metaphorical level. This aptness for metaphor does not 'belittle' scientists, since metaphoric theories 'can have literal entailments' (Lakoff and Johnson 1999: 91) which make non-metaphorical predictions in the form of generalisations or natural laws. These non-metaphorical predictions can always be verified or falsified. A typical example is neuroscience, where most statements are made in terms of the circuitry metaphor, which invokes physical circuits for the conceptualisation of ion channels and glial cells (Lakoff and Johnson 1999: 103). It is through the converging evidence from many different experiments that scientists achieve stable results, in the same way that we deal with real things in everyday life on the basis of intersubjective experience. The critique of Lakoff and Johnson's presentation of embodied or experiential realism and their rejection of objectivist realism is both internal and external. Thus Haser (2005) complains that Lakoff and Johnson's presentation of and quotations from the so-called objectivist literature are not only very scarce, but also ambiguous, which is confirmed in Prandi's (2006) review of Haser. Far less perceived was Geeraerts' thesis (1985, 1993) that the deeper roots of CL is the phenomenologist revolution in philosophy, especially as it was framed by Merleau-Ponty (1945, 1979). This phenomenologist especially stresses consciousness and intentionality in the body's and mind's interaction with its environment. His main thesis is that 'consciousness is present in the corporal experience of the world' (Geeraerts 1985: 355). Here in a nutshell we find all the basic epistemological tenets of CL: its realism and its experientialism as well as its assumptions of embodiment and an embodied mind. In embodied or experiential realism, the phenomena in the world are somehow structured by an intentional or conscious mind. In addition to this 'consciousness' of the perceiving body, other dimensions of the embodied mind have been emphasised in cognitive research, such as the necessity of a 'situated' body (Ziemke et al. 2007) and of a 'sociocultural' situatedness (Frank et al. 2007) as richly illustrated by Yu (2009).

Cognitive grammar

The relation of grammar to cognition

In contrast to the philosophical blank left by Lakoff and Johnson, the psychological background of CL has had a much better fortune thanks to Len Talmy's incorporation of principles of gestalt psychology into his CL exploration of language and thought. Whereas Lakoff and

Johnson mainly concentrate on lexical categorisation, both concrete and abstract, and on reasoning, and less on semantic processes, Talmy has been concerned with both lexicon and grammar, and their relation to cognition. As a highly abstract symbolic system, the grammar of a language is even more intimately linked with, and subject to, general cognitive processes than the lexical system. Talmy (1978, 1988a, 1988b) shows that the structure of grammar is related to principles of gestalt perception, one of which states that the perception of an overall shape comes about by dividing the perceptual field into a more prominent part, the **figure**, and a less salient part or background, for short, the **ground**. It is against this ground that the figure moves, is moved or stands out otherwise. Talmy applies the perceptual principle of figure/ground alignment to complex sentences and shows that the main clause has the function of the figure and the subordinate clause that of the ground. Langacker (see the following section) applies this principle to linguistic structuring at all levels (see also Lakoff 1977). Probing into the relation of grammar to cognition, Talmy 1988a treats the relations between lexicon, grammar and cognition in terms of a building metaphor. Whereas the lexicon can be compared to the single bricks of a building, the **grammar** is 'the conceptual framework or, imagistically, a skeletal structure or scaffolding for the conceptual material that is lexically specified' (Talmy 1988a: 165). The **lexicon** contains content words and reflects the tens of thousands of individual phenomena as single, conceptual categories, whereas the grammar develops more abstract, schematic categories. A schematic category or meaning, e.g., that of the plural morpheme, is one that applies to all possible relevant contexts. Thus the schematic meaning of the plural is the notion of '**multiplexity**', which is found not only with count nouns (*cups*), but also with abstract nouns (*fears*, *misgivings*), uncountable nouns (*ashes*, *waters*), or event nouns (*the silences between the two lovers*). The concept '**multiplex**' is not limited to nouns and the plural morpheme, but can also be found with iterative verb forms as in *He was hitting her.* Thus, whereas the lexicon diversifies the conceptual world more and more, the grammar synthesises, under one common denominator, quite different manifestations of 'more than one', be it concrete or abstract entities, uncountable phenomena, or events. In this way grammatical 'structuring is necessary for a disparate quantity of contentful material to be able to cohere in any sensible way and hence to be amenable to simultaneous cognising as a Gestalt' (Talmy 1988a: 196). Still, lexical and grammatical specifications are to be seen along a continuum ranging from content categories to schematic categories, which, like all categories, are by definition equal in nature. Talmy's own grammatical approach tends to be typologically oriented. Other models of cognitive grammar are Langacker's cognitive grammar and four types of construction grammar.

Cognitive grammar

According to Langacker (1995: 4), all linguistic meaning resides in conceptualisation. For Langacker, all conceptual entities are reduced to two: they are either things like *book* or *linguistics* or relations like *about* or *know*. Here **construction grammar** will see a third conceptual entity, i.e. a fixed pattern in the combination of relations and things, called a construction. In Langacker's view, things and relations are joined together in a compositional way: smaller units are integrated into ever larger relationships like *a book about linguistics* or *I know that book.* Conceptually, a linguistic expression (be it word, phrase, sentence or text) always imposes a '**construal**', i.e. a choice amongst various possibilities, on some body of conceptual content. When describing a conceived situation, a speaker must make choices as to the scope and perspective. **Scope** relates to which aspects of the situation are to be included and which elements are excluded. The **perspective** adopted on the situation involves three components: first, it involves the choice of a vantage point, from which one looks at the situation, e.g., the speaker's or the hearer's position as in *Will you come to me or shall I come to you?* Second, it involves the choice between an objective or subjective construal. An **objective construal** is an explicit setting of the scene, e.g., by using the adverb *before now* the speaker defines the time reference point objectively as the speech act time (*now*); a **subjective construal** only implies an offstage, speaker-dependent reference point, as by

the mere use of the past tense in *I saw him*. Third, perspective involves the choice of a **direction of the mental scanning** as in the opposition between *The roof slopes steeply upward* and *The roof slopes steeply downward*. Once the cogniser/speaker has selected things and relations according to these cognitive processes, he or she assembles them into larger composite wholes such as relationships, clauses, sentences and texts. Not only clauses, but also things and relationships are structured as **gestalts**, consisting of figure and ground. In the case of things, the figure/ground components are a **profile** and a **conceptual base**. Thus, for *strawberry* the ground or conceptual base is the domain of a *strawberry plant* with roots, leaves and fruit, and *strawberry* profiles the fruit. A relationship like *the strawberry on the plate* consists of the relation *on* and the two participants *strawberry* and *plate*. The relation *on* profiles contact or support with a surface in the domain of space. The figure/ground alignment holds between the first participant *strawberry* as a **trajector** – even though it does not move – and the second participant, *plate*, as the **landmark**. Whereas expressions that profile things are, prototypically, nouns, pronouns, determiners and higher-order expressions such as a full noun phrase, expressions such as verbs typically profile relations, in this case: temporal relations or processes; prepositions, adjectives, and non-finite verbs profile atemporal relations.

As stated before, Langacker adopts a view of grammar, known as **compositionality**. On this view, simple expressions can be assembled into complex expressions by grammatical patterns or constructions. A typical **construction** consists of two components that are integrated both semantically and phonologically. Such a composite structure, e.g., *the strawberry on my neighbour's plate* depends on correspondences between the subparts of the two components, i.e. *strawberry on X*, and *my neighbour's plate*. The corresponding entities *X* and *plate* are superimposed, i.e. their specifications are merged to form the composite structure. Finally, the figure/ground relation is also operative in the process of grounding a conceived situation in the speech event, comprising the speech act, its participants (speaker and hearer), and speech-act time. The speech event serves as the ground, and the linguistic expression communicated as the figure. The grounding of situations is achieved by means of the tense system for temporal relationships and by the determiner system for referential relations (see further Langacker 1987; 1991a; 1991b; 1999).

Construction grammars

Construction grammars differ from Langacker's cognitive grammar in that they reject compositionality as the only or main principle governing the grammar of a language, and claim that languages have numerous fixed or idiomatic expressions or 'constructions', i.e. grammatical units in themselves. There are four main constructionist approaches. First there is Fillmore's construction grammar and **frame semantics**, which is still partly generative and only partly cognitive because of its non-commitment to the interactional relatedness of linguistic and other cognitive faculties (see Kay and Fillmore 1999; Kay et al. 2005). Further there are three fully cognitive construction grammar models: Goldberg's 1995 construction grammar (also referred to as **CxG**), Croft's (2004) **radical construction grammar**, and Bergen and Chang's (2005) **embodied construction grammar**. Reasons of space allow us to go into Goldberg's CxG only. According to Langacker (1991: 8), the difference between cognitive grammar (**CG**) and CxG is that whereas CG considers constructions to be reducible 'to symbolic relationships', in CxG 'grammatical classes and other constructs are still thought of as a separate level of organisation'. But more is at stake than a 'separate level of organisation'; it is equally a question of 'constructional meaning', as has been pointed out by diverse 'constructivists' such as Lakoff (1987a: 467, 538), Goldberg (1995; 1996), Fillmore (1996), Kay and Fillmore (1999) and many others. That is, construction grammar starts from the existence of gestalt-like patterns or '**established configurations**' which are both simpler to produce and also have meaning relations between the composing parts above their ad hoc composition. According to Goldberg (1995: 4), such patterns or constructions 'carry meanings independently of the words in the sentence'. A few instances of very frequently used constructions are the transitive construction, the intransitive construction, the passive construction, and the ditransitive construction or

double-object construction (Goldberg 1992); less frequent, but still common, are the middle construction (*This book sells well*), the incredulity response construction (*What? Him write a novel?!*), the *let-alone* construction (Fillmore et al. 1988), etc. The **middle construction** is a special case of the intransitive construction such as *The book fell down*, which combines at least four semantic relations beyond the assembly of constituent parts. First, the verb is often a transitive verb (like *sell*), but used intransitively. Second, the subject *book* goes beyond the semantic value of a non-agentive intransitive in that it has some special properties that 'enable' what is denoted by the predicate, *sell well* (Yoshimura 1998: 279). Third, unlike the intransitive construction, which may take all possible tenses, the middle construction prototypically occurs in the simple present, suggesting a kind of genericness. Fourth, the middle construction requires an adverbial or other modifier specifying the manner of what the predicate denotes. According to Taylor (1998: 21), constructions are thus schemata which have to be characterised by criteria such as the configuration of the parts, the contribution of the parts to the overall meaning of the construction, and the semantic, pragmatic, and discourse value of the construction (the middle construction is especially favoured in advertising). In a nutshell, the semantic relation of 'property' does not come from the assembly of *book* with *sell*, but it originates from the gestalt of the construction as a whole. In other words, constructions are instantiated by linguistic expressions which 'inherit' their (more) abstract relations from the higher sanctioning construction. Thus, the middle construction need not only use what would be a direct object in a transitive construction (*sell a book*), but it can, though marginally, also have a locative as in the following bookseller's exchange: '*Where shall we put the new travel book?*' – '*Well, the corner shop window sells very well*'. Obviously, we can observe prototypicality effects in this construction too, demonstrating that we witness the impact of the same very general cognitive principles at all levels of linguistic structure.

Mental spaces

CL is not only a lexico-grammatical theory of language; it also embraces the whole of language functions and structure, including pragmatic and discourse dimensions. In discourse, various knowledge frames, linguistic or non-linguistic, are invoked, which Fauconnier (1985/1994) called **mental spaces**. Each utterance, even each content word, in discourse reflects and evokes a mental representation of some situation. For the encoding and interpretation of mental representations we draw not only on the linguistic expression, but also on the speech situation, and on encyclopedic knowledge, often called world knowledge. Each utterance is based in a mental space which is the speaker's perspective and possibly shared by other participants in the speech event. This is the base space (space 0). In base space we can open new spaces as illustrated in a much discussed example *I dreamt I was Marilyn Monroe and kissed me*. Here *I dreamt* is part of the base space, and the verb *dream* is a space-builder opening a new space (space 1) of an imagined world in which the second *I* (*was Marilyn Monroe*) is no longer identical with the first *I* (*dreamt*) in the base space, but is part of a new knowledge frame in which Marilyn Monroe is not kissing herself, but the speaker, i.e. the *I* in the base space. **Mental Space Theory (MST)** initially started out as a cognitive alternative to traditional theories of reference that was able to solve many of the referential problems left unsolved by logic-oriented trends in generative linguistics. Gradually MST has, in the work of Fauconnier (1997) and Fauconnier and Sweetser (1996), developed into an encompassing cognitive theory of discourse and discourse management. In the development of the ongoing discourse, speaker(s) and hearer(s) have to keep track of all the mental spaces opened up and can at any time go back to any of them to elaborate them further. Still, MST is not limited to reference or discourse management, but also explores grammatical problems such as the tense-aspect-modality system serving the grammatical functions of perspective, viewpoint, epistemic distance and **grounding**. This last concept, which is Langacker's term for anchoring the speech act and the whole discourse in the actual reality of the speech act situation and speech time, can directly be linked to Fauconnier's notion of 'base space'. Furthermore, MST is also at the basis of Fauconnier and Turner's metaphor theory,

which is known as **conceptual blending theory (CBT)**. According to Fauconnier and Turner the source domain of a metaphorical expression is not just mapped onto the target domain as in Lakoff and Johnson's **conceptual metaphor theory**, but both the source and target domains are input spaces, which, via the generic space containing their common elements, are blended or integrated into the blend, which may also contain new emergent meaning, not present in the input spaces. CBT does not intend to replace conceptual metaphor theory, but the two models are to be seen as complementary rather than as rivals, as claimed by Grady et al. (1999: 101): blending theorists are said to look at the particulars of single metaphorical expressions, whereas conceptual metaphor theorists are more interested in generalisations over and conventional patterns across metaphors. This also reveals the desirability of a stronger integration of the various CL strands into a more synthetical view. This line of thought is also followed by Langacker (2003a, 2003b), who strives to come closer to and integrate views from both Fauconnier's mental space theory and Goldberg's construction grammar. That a harmonic integration of the various CL strands is feasible at the descriptive level has been shown in Radden and Dirven's (2007) *Cognitive English Grammar*

R. D.

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Suggestions for further reading

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From computational linguistics to natural language engineering

Introduction

The idea that computers might be able to understand the languages that humans speak (**'natural' languages**) has considerable attractions. It is tempting in two quite distinct ways:

1. Computers that could understand natural languages, especially spoken natural languages, would be extremely useful. They would be easy to use, since there would be no need to learn special codes (programming languages, database query languages …). You would simply be able to tell them what you wanted them to do. They would also be able to carry out various tasks, such as translation from one language to another or searching through vast repositories of information to find answers to questions, which otherwise take considerable skill and/or effort.
2. Since the ability to use language is one of the key features that distinguish humans from other animals, trying to develop theories of language is just intrinsically interesting. Trying to couch such theories in ways that

> mean they can be embodied as computer programs adds extra rigour, since computer programs are very unforgiving if you don't fill in all the steps. Expressing your theory as a program means that you become very aware of places where you have left a gap, and it also provides a powerful test bed. Programs often do things that you did not expect, and tracking down why this happens will reveal problems in your theory. Programs for analysing syntactic structure, for instance, often produce quite unexpected analyses. This happens because the underlying syntactic theory over-generates. This can be extremely hard to spot just by thinking about it, but the behaviour of an implemented version of a theory frequently reveals unexpected consequences and problems.

These two motivations for constructing machines that can understand language have been intermingled since the early days of computing. Following the earliest attempts to build machine translation systems by using bilingual lookup tables (see Nirenburg et al. 2003 for a comprehensive overview of the history of machine translation systems), people trying to develop systems for processing natural language have been aware of the need to carry out structural analysis of the texts they are interested in and to construct representations of their contents. One obvious place to look for ideas about how to do this is theoretical linguistics, and there has been a very fruitful interchange of ideas, with computational linguists exploiting work in theoretical linguistics and then using the tools and requirements of computational frameworks to develop this work in directions that might not otherwise have been explored. At the same time, computational linguists have been aware that some of the problems that face them require quite different kinds of approaches.

To take a simple example, most linguists trying to develop theories of syntax are interested in the constraints that govern whether a sentence is well-formed or not. That is not to say that linguists believe that language users invariably, or even frequently, produce well-formed sentences, but that they believe that language users do have access to a set of principles which allow them to make well-formedness judgements. If there are such principles, then discovering them should be the principal aim of syntactic theory. People trying to make systems that process language, on the other hand, are immediately confronted with the presence of texts that are not well formed. They might agree that there are rules and principles that describe the well-formed sentences of the language they are interested in, and that native speakers of that language will have internalised those rules and principles. But the texts that they want to deal with will not reliably obey them. They will contain **production errors** (spelling mistakes, typographical errors and so on), they will contain simple mistakes (particularly if they have been produced by non-native speakers), and they will contain constructions which are indeed grammatical but which are outside the scope of the theory being used. If you are interested in the principles that govern well-formedness in a language, you can (and indeed should) ignore such cases. Given that native speakers can make fairly consistent judgements about well-formedness, looking for the principles that they use for this task seems like a sensible and worthwhile activity, and if that is what you are doing then ill-formed texts are of interest only as a source of counter-examples. But if you want to develop a system that can, for instance, translate arbitrary English web pages into Arabic, you can hardly afford to skip over every ill-formed sentence. You therefore need to develop approaches to syntax that assign appropriate structures to ill-formed texts as well as accounting for well-formed ones.

People working on computational approaches to language, then, are often faced with problems that do not concern theoretical linguists. How can we assign a syntactic structure to an ill-formed sentence? How can we spot that the first occurrence of the word 'principle' in 'The principle aim of syntactic theory is to discover the principles of well-formedness' should have been 'principal'? How can we search a collection of documents to find the one that is most likely to contain the answer to the question 'Where is Henry VIII's fourth wife buried?'?

Some of these issues require quite different machinery. The solutions to at least some of these problems involve looking for patterns in large corpora (anything from 100 million words

upwards), using a mixture of orthodox statistical techniques and ideas from machine learning (see Witten and Frank 2005 for discussion of machine learning techniques and the history of machine learning). It is also important to develop algorithms that can exploit orthodox linguistic principles where these apply, but which can operate robustly when they do not.

Work on computer processing of natural languages thus splits into two parts: extensions and adaptations of standard linguistic theory, which we will call 'Computational Linguistics', and algorithms and theories for dealing with noisy/ill-formed text and for extracting information from very large bodies of text, which we will call 'Language Engineering'. The two fields clearly interact, but the kinds of theory that they each concentrate on are sufficiently distinct for this to be a useful division.

Computational linguistics

It is widely agreed that language involves a series of structural choices, each of which encodes some part of the message that the speaker/writer wishes to convey. (For simplicity we will generally refer to the speaker, rather than the speaker/writer, even when talking about written language.)

If that is the case, then the study of language should address the set of possible structural choices and the way that each such choice encodes part of the message. Computationally oriented study of language is no different and should address the same issues in ways that can be implemented as programs. We will discuss the key properties of computational approaches to the traditional levels of linguistic description below.

There are, however, further constraints on computational descriptions of the individual levels. First, it is important to describe each level in ways that make connections between levels easy. Controlling the information flow between levels of description is important for computational approaches, because it turns out that decisions at one level are often critically dependent on information that is available at another. This is particularly awkward if the required information is at a 'higher' level. In general, for instance, you would expect to carry out morphological analysis before you tried to find the syntactic structure of a text. How could you expect to parse 'Morphology is easier than syntax' if you had not carried out the morphological analysis that let you see that 'easier' is a comparative adjective. In some situations, however, the morphological structure of an item cannot be determined until its syntactic role is known. Consider for instance (1):

(1) a. اعتقد الدرس أن التالبة تكتب الدرس. (*ā'tqd ālmdrs 'n āltālbt tktb āldrs.*)
    b. أمر الدرس أن تكتب التالبة الدرس. (*'mr ālmdrs 'n tktb āltālbt āldrs.*)

It is not possible to determine the full forms of the surface forms ن (*n*) and التالبة (*āltālbt*) in these examples until you know that ن (*n*) in (1a) is governed by اعتقد (*ā'tqd*), and hence has the underlying form أنَّ (**anna**), which in turns requires an embedded clause with an indicative verb إِعْتَقَدَ (**i'taqada**) and a nominative subject اَلْتَّالِبَتَ (**āltālibata**), whereas in (1b) ن (*n*) is governed by أمر (*'mr*) and hence has the form أنْ (**an**) with a clause containing a subjunctive verb تَكْتُبَ (**taktuba**) with an accusative subject اَلْتَّالِبَتُ (**altālibatu**).

Thus the morphologyof these items is dependent on their syntactic roles, and any computational system (such as a text-to-speech system) that needs to know about their morphology will have to have an architecture that allows syntactic analysis to be carried out on text whose morphology has not been fully analysed.

The second constraint is that where a computational implementation of a linguistic theory is being used as the basis of some application, rather than as a testbed for the theory, it will have to be linked to some 'back-end' application – a database, an information service, a device controller, etc. This means that the format in which the message being carried by a sentence is represented must be compatible with the format used by the application. If you want, for instance, to use natural language for querying a database, the meaning representations constructed by the NLP system will have to be converted into database queries. This clearly constrains the forms of meaning representations. We will revisit this point when we discuss semantics and pragmatics below.

Words

> 'I am aware of the problems that arise in defining the word, […]. Nevertheless, it seems to be widely agreed among linguists these days that most, or perhaps even all, languages make use of units which could reasonably be called words'.
>
> (Hudson 1984)

Any theory of language, computational or otherwise, has to have something to say about words. As the quote above shows there can be some questions at the margins about which items count as words – is *'Gastarbeiter'* a German word meaning 'guest worker', or is it two words *'Gast'* and *'Arbeiter'* which happen to be written without an intervening space, are the items 'going' and 'to' in 'I'm going to kill him' two words, or one word ('gonna') which happens to be written with a space inside it?

Whatever the decision on marginal cases like these, it does seem that there are bundles of information relating surface forms, distributional patterns and meanings which should be stored together. The *Concise Oxford Dictionary*, for instance, has an entry for 'marginal' which provides information about its pronunciation (specifying how the vowel 'a' should be pronounced in this word and where the main stress falls); about its **distribution** (that it is used as an adjective); and about what it means, in the form of a series of definitions and examples.

From a computational point of view, the nature of the information to be bundled together as a 'word' is very much the same as for any linguistic theory (and indeed as for a typical dictionary): you need to know what it looks like (and what it sounds like if you are interested in speech synthesis or recognition), you need to know what constructions it can take part in, and you need to know what it means. How each of these is represented computationally will vary, depending on your theories of morphology, syntax and semantics, as discussed below. The key general issue for computational linguistics is: how are such bundles of information stored and retrieved? Storage and retrieval are in general critical issues for computational systems. They are extremely tightly linked, since there is no point in storing information unless you can retrieve it, and storage mechanisms are usually designed with a specific retrieval mechanism in mind.

Given that words are a bundles of information, you may need to have more than one way of retrieving them. If you are trying to understand a spoken utterance, you will need to be able to retrieve the words corresponding to particular sequences of sound patterns; if you are trying to understand a written sentence, you will need to be able to retrieve the words corresponding to particular sequences of characters; if you are trying to translate from one language to another, you will need to be able to find words in the target language that express the concepts expressed in the source (and there is no reason to suppose that there will be a 1–1 mapping where each word in the source language corresponds to one word in the target); and if you are trying to express some information that has been derived by the computer in response to an input from a user, you will need to be able to find words that express specific meanings, via something more like a thesaurus than like a dictionary.

Each of these tasks starts from a different perspective, and hence they each require a different retrieval mechanism. To retrieve a word on the basis of its written form, you need a retrieval mechanism that inspects the sequence of characters. But a representation that facilitates very fast retrieval from a sequence of characters is not going to help you to find the right words to express a given meaning. We will consider how to store words in a way that makes it easy to find them from their surface form in the section on morphology below, since there are strong links between this task and morphological analysis. There are no widely agreed mechanisms for other retrieval tasks, but one thing is clear: the same information has to be stored, no matter how it is to be retrieved. This means that it is important to have mechanisms which let you input a description of a word just once and store it so that it can be accessed via multiple routes. Providing two (or more) descriptions of each word would be extremely tedious. It would also be very dangerous, because unless you were extremely careful to ensure that each version of the same word contained the same information, you would be likely to end up having different

views of what a given word meant depending on whether you were reading or writing it. It is therefore crucial to have a neutral format for specifying the bundle of information that makes up a word, together with mechanisms for storing that information in ways that make it easy to retrieve.

Morphology

A single 'word' may correspond to a number of surface forms. In English, for instance, the forms 'worry', 'worries', 'worrying' and 'worried' are all variants on the same word. Furthermore, several words may all be closely related to some core term, e.g., 'vision', 'revision', 'envision' (in many case the core term may not itself be a word – 'instruction', 'destruction', 'construction').

The idea of putting all these forms into a lexicon is unappealing. It is hard work, it is difficult to ensure that all the forms carry the same core information, it takes up extra memory, and it slows down the retrieval process. What we want to do is to include a single description of a word in the lexicon, and then retrieve it no matter which of its forms was produced.

In the simplest cases, e.g., English regular verbs, a surface form will be made out of a root and one of a number of affixes. The forms 'walk', 'walks', 'walking' and 'walked' are clearly obtained by adding the affixes *''*, *'s'*, *'ing'* and *'ed'* to the end of the root *'walk'*. To cope with this, we need to include the sets of affixes in our lexicon, specifying what kinds of words they can attach to and what the effect of attaching them is. When faced with a surface form we would then look in the lexicon for entries that could be concatenated to form the particular form.

This simple picture is, however, grossly optimistic.

1. There are often boundary effects when a root and an affix are joined. Sometimes these have a phonological origin, e.g., when the prefix *in-* is added to a word beginning with *p* or *b* it is transformed into *im-* because of the difficulty of articulating an *n* followed by a *p* or *b* (trying saying 'inpossible'!). Sometimes they reflect a conventional relation between spelling and pronunciation. The present participle form of 'infer', for instance, is 'inferring', with the *r* repeated, whereas the present participle form of 'enter' is 'entering' with a single *r*. This arises from the convention that when a non-final short vowel is stressed then it cannot be followed by an isolated consonant. And sometimes they seem to be arbitrary, e.g., the rules concerning when a final *y* is changed to *ie*.
2. In many languages, different sets of affixes perform the same function for particular groups of words. To take a simple example, French verbs select from a small group of possible sets of tense markers, so that verbs that have *er* as their infinitives take different tense and agreement markers from ones whose infinitives end in *ir* or *re*. Information about which lexical class any particular root belongs has to be included in the description of that root, and then the affixes have to be constrained so that they attach to the right roots.
3. Many roots undergo internal changes as well as affixation. This can be almost entirely irregular (as with English irregular verbs like 'bring/brought', 'break/broke/broken', 'drink/drank/drunk'), or almost entirely regular, as with Arabic diacritic patterns, or somewhere in between. In all such cases, the alternations associated with different forms can make the process of searching through the lexicon for the appropriate root considerably more difficult.

Computational approaches to morphology generally exploit a simple class of device known as '**finite state automata**' (**FSAs**). An FSA consists of a set of states connected by labelled arcs. A lexicon, for instance, can be represented as an FSA as shown in Figure 1.

The obvious advantage of this representation is that it saves you lookup time. At each point, you are led directly to the next possible node, so that there is a minimum of search (and hence of backtracking).

Suppose, for instance, that you had a 20,000 word dictionary, where the average word length is six characters, with the following words at the end: *zaibatsu*, *zander*, *zeal*, *zebra*, *zenith*, *zeolite*, *zero*, *zest*, *zidovudine*, *zigzag*, *zinc*, *zip*, *zither*, *zloty*, *zodiac*, *zombie*, *zone*, *zoo*, *zoology*, *zoom*, *zoot*. Then to look up *'zoom'* in a straight alphabetic list you would have to do something between 20,000 and

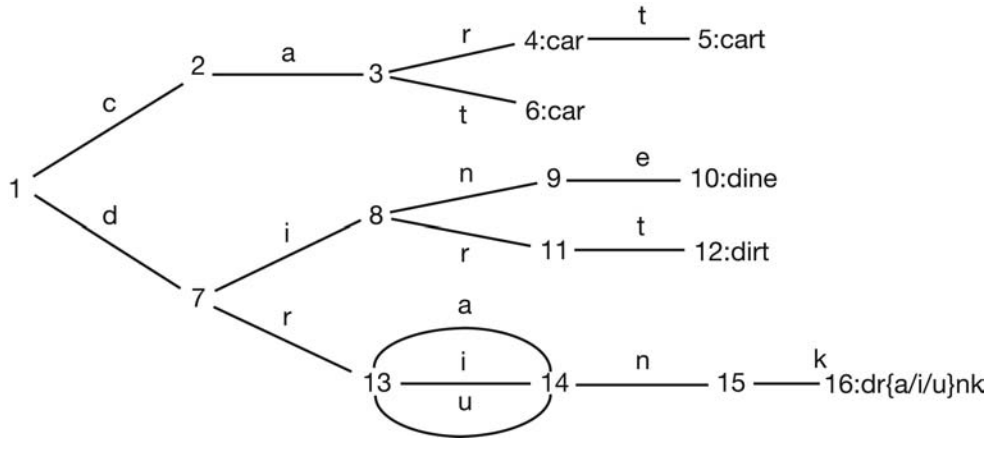

Figure 1 Representation of 'car', 'cart', 'cat', 'dine', 'dirt', 'drank', 'drink', 'drunk'.

120,000 comparisons. To look it up in the current representation you would do 26 + 3 + 4 + 2 comparisons. In abstract terms, the lookup time is $o(N \times I)$ for a simple linear list representation and $o(log(26 \times I))$ for the branching tree representation, where N is the number of words in the dictionary and I is the maximum length of a word.

As noted, however, we do not just have to store and retrieve roots. We have to recognise that 'walk', 'walks', 'walking' and 'walked' are variants of the same word, obtained by adding a tense marker to the root 'walk'. To cope with this we have to specify what kind of affix(es) a given root requires, and we have to take account of the boundary changes that can occur when a root and an affix are combined.

The easiest way to specify the affixes that a given root requires is to list them when we enter the root into the dictionary. Suppose for instance we had entered a structure like {root = *'dine'*, affixes = [suffix (tense)]} rather than just the string *'dine'* into Figure 1. Then if we were trying to look up the surface form *'dines'* in this network, we would get to the end of the branch leading to {root = *'dine'*, affixes = [suffix (tense)]}, and we would find that we had *'s'* left in our string and that the word we had found needed a tense marker. If we had also recorded (possibly in the same network) that *'s'* was a tense marker then we would realise that the characters that we had left were indeed the affix that we needed.

Suppose, however, that instead of 'dines' we were looking at 'dining'. Looking for this in our network would not lead to anywhere, since there is nothing in the surface form that will let us traverse the *'e'* arc from (9) to (10). We need 'spelling rules' describing the boundary effects when morphemes are concatenated. These rules are a combination of phonological rules, describing the way the sounds of the elements are changed at the boundary (Chomsky and Halle 1968), and graphological rules, relating sounds to written forms. Figure 2 shows some typical examples, where `c0, c1, ..., v0, v1 ...` denote consonants and vowels.

The first of the rules in Figure 2, for instance, says that where you see a sequence consisting of a consonant followed by a vowel then it might be that a root that ended with that consonant followed by an *'e'* has been combined with a suffix that starts with a vowel, with the *'e'* disappearing from the surface form. The second says that where you see a sequence consisting of a consonant, a vowel, a repeated consonant and a vowel then it might be that a root that ends consonant-vowel-consonant has had an affix that starts with a vowel added ('putting', 'inferred').

Such rules can be converted to 'two-level' automata (Koskiennemi 1985; Ritchie et al. 1992) as in Figure 3. The labels above the arcs correspond to surface forms (the left-hand sides of the rules in Figure 2), and the labels below the arcs correspond to underlying forms (right-hand sides).

```
% chas^ing ==> chase+ing, chas^ed ==> chase+ed
[c0, v0] ==> [c0, e, +, v0].

& putting ==> put+ing
[c0, v0, c1, c1, v1] ==> [c0, v0, c1, +, v1].
```

Figure 2 Boundary rules for English.

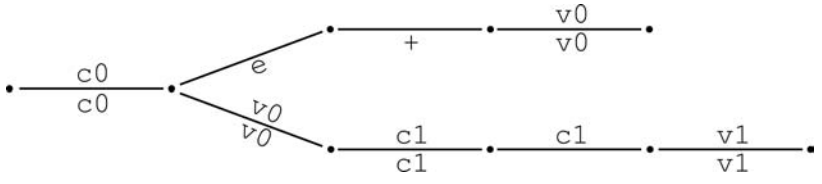

Figure 3 The rules from Figure 2 as a two-level automaton.

If we capture spelling rules in two-level automata of this kind then we can easily mesh the search through the lexicon with application of spelling rules. Note that spelling rules with the same initial segments can be easily merged, as with the single initial arc in Figure 3, which represents the common start of the two rules in Figure 2 (though these two rules diverge at the next step, because although they both have a vowel as the next item of the left-hand sides they differ at the next point in the right-hand side). The need to merge different processing levels is a recurrent theme in computational treatments of language. Representing words in a simple automaton, and associating a list of required affixes with a root, and representing boundary effect rules as two-level automata are all sensible ideas in themselves. But the fact that they can be merged so that they are all exploited together is a crucial additional benefit. It is much better to apply a spelling rule when you have already checked that you are on the way to finding a dictionary entry than to try out spelling rules independently of looking in the dictionary, and likewise for dealing with affixes.

Syntax

The choice of words carries part of the message. The way that those words are arranged carries the remainder. To take a simple example, (2a) and (2b) contain the same words, but carry very different messages.

(2) a. Mary loves John.
    b. John loves Mary.

The only difference between these two is that the words are arranged differently. So if they carry different messages, it must be because of the way the words are arranged.

The study of how words can be arranged in a given language – its 'syntax' – is, of course, a core area of linguistics, and is covered at length in other parts of this encyclopedia. For a computational treatment of language, however, we have to have algorithms which let us use the rules that describe the structure of a language in order to discover the structure underlying an input sentence. The nature of these algorithms means that they are better suited to some kinds of grammatical framework than to others, and this has in turn influenced the development of grammatical frameworks.

The key computational issue, then, is the development of parsing algorithms. We will therefore start by considering the main styles of parsing algorithm, which we will illustrate with a simple grammar written in a straightforward framework. As we will see, this framework is inadequate for describing the subtleties of natural language syntax. We will look briefly at the ways in which it is inadequate, and the consequences for parsing algorithms, below, but we start by taking a very simple view.

We start by assuming that texts are made up of groups of (groups of) words, where a larger

```
s ==> np, vp

np ==> pronoun
np ==> det, nn
nn ==> noun
nn ==> nn, pp
nn ==>adj, nn

pp ==> prep, np

vp ==> iverb
vp ==> tverb, np
vp ==> dverb, np, np
vp ==> dverb, np, pp
vp ==> vp, pp
```

Figure 4 Simple phrase structure grammar for English.

group can be made of smaller groups and individual words. If that is how language is organised, then we can write sets of rules which specify what the elements of a group are as in Figure 4.

This grammar would allow us to analyse (3) and assign it the phrase structure tree in Figure 5.

(3) The cat sat on the mat.

There are two obvious ways of writing an algorithm to carry out this task: 'top-down' or 'bottom-up'.

Top-down

Suppose you were faced with the text 'the cat sat on the mat' and you want to see whether it is a sentence according to the rules in Figure 4. To see if it was a sentence, you could look for a rule that said what a sentence was made out of. The first (and with this grammar only) rule that describes what a sentence is made out of says that it is made of an NP and a VP. So if the text is to fit this rule, you would have to find an NP followed by a VP. There are two rules for NPs. The first says that an NP could be made out of a pronoun, so you would look at the text to see if it started with a pronoun. It doesn't, so you would then have to try to find another rule about NPs. There is another rule, which says that an NP could be made out of a determiner and an NN. So you would look at the text, see that it started with 'the', which is a determiner. You would now want to find an NN, so you would look at the NN rules. The first of these says that an NN could be made out of a noun. So you would look at the text again, find that the next word, 'cat', was a noun. At this point you would decide that

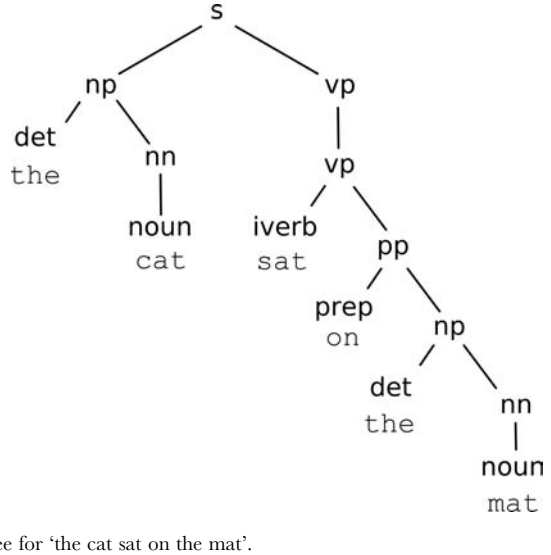

Figure 5 Phrase structure tree for 'the cat sat on the mat'.

the text did start with an NP, so you would now move on to see whether the remainder was a VP.

Bottom-up

Alternatively, you could look at the text and see what rules could be applied to it. Since 'cat' is a noun, the rule nn → noun means that you could replace it by the label nn, rewriting the text as 'the nn sat on the mat'. This now contains a sequence consisting of a determiner, 'the', and the symbol nn. This matches the right-hand side of the rule np → det, nn, so you could replace these two items by np, transforming the text to 'np sat on the mat', and so on until you had replaced the entire text by the symbol s.

Both these approaches will work if you have a tiny grammar like the one in Figure 4 and simple sentences like (3). There are, however, problems when you try to use a more serious grammar and when you want to analyse more complex sentences.

The problems arise because as you apply the algorithms you have to make choices. In the top-down algorithm there will be numerous rules that could be applied to expand a specific node. In the grammar in Figure 4, for instance, there were three rules for expanding the symbol vp, and to get an analysis of the given text you would have to use the third of these rules, which would again require you to expand the same symbol, but this time using the first rule. In a more serious grammar there might hundreds or even thousands of rules. When you try to apply them top-down, the algorithm has very little information about which ones to try first, and hence can spend a long exploring blind alleys. Bottom-up algorithms are faced with a similar set of problems, compounded by the fact that many (maybe even most) words have a number of interpretations. The English word 'that', for instance, might be a complementiser, or a relative pronoun, or a demonstrative pronoun, or a determiner. Each of these has the potential for triggering different rules, and hence of again leading to a great deal of search (consider what would happen if you tried to analyse 'I said that was enough / I said that meal was very nice / I said that she is a fool').

Managing the 'combinatorial explosion' that these choices lead to is crucial to the development of effective parsing algorithms. A number of techniques have been developed to help with this:

- Make sure that you do not do the same work twice. Suppose, for instance, that you were trying to analyse the sentence 'I saw the man who stole your bike riding it in the park'. If you tried to parse this top-down, you would probably start by seeing 'saw' as a transitive verb, look for the following NP, and after a considerable amount of effort find that 'the man who stole your bike' is a candidate. Unfortunately, 'saw' here is takes something like a non-finite clause ('the man who stole your bike riding it in the park') as its complement, not just a simple NP. But to discover this phrase you would have to realise that 'the man who stole your bike' was its subject. You really do not want to have to repeat all the work that went into finding this NP as a potential object of 'saw' in order to realise that it is a potential subject of 'riding it in the park'. A number of techniques for avoiding repeated work of this kind have been developed (Early's algorithm, CKY-algorithm, chart-parsing). Using these techniques can have dramatic effects on the amount of work you have to carry out by making sure that you do not re-analyse text that you have already looked at.
- Make sensible choices. In the examples involving 'that' above, for instance, looking at the following word would provide very strong hints about its part of speech. If it is followed by a verb (' … that was … ') then it is extremely likely to be a pronoun; if it is followed by a noun (' … that meal … ') then it is probably a determiner; if it is followed by a subject-case NP (' … that she … ') then it is probably a complementiser. Clues of this kind can only ever be guesses. If 'that' is followed by a subject-case pronoun then it is likely to be complementiser, but it might also be a relative pronoun ('I introduced her to the man that she eventually married'), and if it is followed by a noun then it is likely to be a determiner but it might be a complementiser ('I know that fish lay eggs rather than live young'). In any case, you do not always know what kind of word is adjacent

to the one you are interested in (so 'fish' in 'People that fish there never catch anything except old boots' is a verb, rather than a noun). Nonetheless, using statistical evidence about parts of speech, and about the likelihood of particular constructions, can improve performance. Simply noting that 'fish' is used as a noun 65 per cent of the time and as a verb 35 per cent of the time would make parsing 65 per cent of sentences with the word 'fish' in quicker!

- Use good search strategies. Simple top-down parsing makes poor choices because it does not pay any attention to the actual text until rules with pre-terminal symbols are inspected, which may not happen until a great deal of speculative work has been carried out. Simple bottom-up parsing may lead to the construction of items which cannot contribute to an analysis of the entire text. If you can combine the best of both approaches then some of this can be avoided. Strategies that allow lexical items to indicate which rules are most likely to succeed ('left-corner' (Griffiths and Petrick 1965), 'head-corner' (van Nord 1991)) can help, particularly when used with a chart-parser and with highly lexical grammars.

Even if you make use of the best possible parsing algorithm, however, there are a number of remaining issues.

First, simple context-free grammars of the kind illustrated in Figure 4 are not adequate for describing the grammar of natural languages. This is unfortunate from a computational point of view, since parsing algorithms for context-free grammars are easy to write and comparatively efficient. If context-free grammars are unsuitable, we have to be careful about the computational consequences of any extensions that we make.

Fine-grained features

The grammar in Figure 4 would assign an analysis to (4).

(4) Him eat a peaches.

'Him' is a pronoun, so it could be an np and hence could the initial np in an s. 'Peaches' is a noun, so it could make an nn, which could then combine with the det 'a' to make an np. This could then combine with the verb 'eat' to make a vp, which could be the vp in the s that starts with 'Him'.

This is clearly nonsense. 'Him' is the wrong form for a subject, 'a' is singular and 'peaches' is plural, 'eat' cannot have a third person singular subject. The rules in Figure 4, however, do not allow us to distinguish between subject and object cases, or between singular and plural nouns.

We could try to rewrite this grammar with finer-grained labels, as in Figure 6. The grammar now has two rules for making sentences where we had one before, two rules for making VPs out of transitive verbs where we had one before, nine (!) for making NPs where we had two before, …

Multiplying the grammar out in this way is very unattractive. Each time we introduce a distinction we are likely to have to duplicate some set of rules. As we do so, the parsing process gets slower, since there are more rules to explore. For cases like these, introducing '**feature:value**' pairs helps. If we allow terms in the grammar to have named properties, we can put constraints on the values of those properties in specific situations. Figure 7 illustrates this for our simple grammar.

The first rule here says that an s can be made out of an np and a vp so long as the np has the value nom for its case and the np and vp have the same value for their agr (using the convention that upper-case terms denote variables which have to have the same value wherever they appear). Where a feature is not mentioned then there are no constraints on its value. For example, the object of a transitive verb has to have acc as its case, but its agr does not matter.

Figure 7 expresses the same set of rules as Figure 6 but only requires the same number of rules as Figure 4. Applying each rule does require slightly more effort than applying one of the rules from Figure 4, since we have to match all the features as well as the major label. However, this kind of symmetric matching of partially specified patterns can be done very efficiently via a process known as 'unification', and the advantages of keeping the number of rules small (as in Figure 4) but making the necessary fine distinctions (as in Figure 6) outweigh the cost of unification.

The grammar in Figure 7 makes a distinction between the major category (s, np, vp, …) and the minor features. It can be useful to obliterate this distinction and let the category be just another feature, as in Figure 8. We will see various advantages of this below.

Can we put other kinds of constraints on features? We might, for instance, want to say that a feature must have one of a range of values, e.g., that the French verb *'mange'* is either first person singular or third person singular, or that it must not have one of a range of values, or that its value depends on the value of some other feature. If the constraints become too complicated then the matching process can become so slow that any advantages gained by using it are cancelled out. In the limit, the constraints could require arbitrary amounts of computation. There

```
s ==> singularsubjnp, singularvp
s ==> pluralsubjnp, pluralvp

singularsubjnp ==> singularsubjpronoun
pluralsubjnp ==> pluralsubjpronoun
objnp ==> objpronoun
singularsubjnp ==> singularplainnp
pluralsubjnp ==> pluralplainnp
objnp ==> singularplainnp
objnp ==> pluralplainnp

singularplainnp ==> singulardet, singularnn
singularnn ==> singularnoun
singularnn ==> singularnn, pp
singularnn ==> adj, singularnn

pluralplainnp ==> pluraldet, pluralnn
pluralnn ==> pluralnoun
pluralnn ==> pluralnn, pp
pluralnn ==> adj, pluralnn

singularvp ==> singulartverb, objnp
pluralvp ==> pluraltverb, objnp
```

Figure 6 Phrase structure grammar with fine-grained labels.

```
s ==> np[case=nom, agree=AGR], vp[agree=AGR]

np[case=CASE, agree=AGR] ==> pronoun[case=CASE, agree=AGR]
np[agree=AGR] ==> det[agree=AGR], nn[agree=AGR]
nn[agree=AGR] ==> noun[agree=AGR]
nn[agree=AGR] ==> nn[agree=AGR], pp
nn[agree=AGR] ==> adj, nn[agree=AGR]

pp ==> prep, np[case=acc]

vp[agree=AGR] ==> iverb[agree=AGR]
vp[agree=AGR] ==> tverb[agree=AGR], np[case=acc]
...
```

Figure 7 Definite clause grammar for English.

```
[cat=s] ==> [cat=np, case=nom, agree=AGR], cat=vp, agree=AGR]

[cat=np, case=CASE, agree=AGR] ==> [cat=pronoun, case=CASE, agree=AGR]
[cat=np, agree=AGR] ==> [cat=det, agree=AGR], [cat=nn, agree=AGR]
[cat=nn, agree=AGR] ==> [cat=noun, agree=AGR]
[cat=nn, agree=AGR] ==> [cat=nn, agree=AGR], [cat=pp]
[cat=nn, agree=AGR] ==> [cat=adj], [cat=nn, agree=AGR]

[cat=pp] ==> [cat=prep], [cat=np, case=acc]

[cat=vp, agree=AGR] ==> [cat=iverb, agree=AGR]
[cat=vp, agree=AGR] ==> [cat=tverb, agree=AGR], [cat=np, case=acc]
...
```

Figure 8 The 'major category' is just another feature.

has been a great deal of work on developing variants of the basic unification algorithm which make it possible to state interesting constraints without incurring huge expense (Rounds 1988; Lascarides and Copestake 1999; Maxwell and Kaplan 1995). Unification algorithms are of interest in a number of other areas of computer science, and many of the developments of these algorithms have been imported into non-computational descriptions of syntax.

Extraposition and free word-order languages

The grammars we have seen so far assume that large phrases are made out of smaller phrases adjacent to one another. For some languages this is largely true. Most of the time an English verb, for instance, is preceded by its subject and followed by its complements. Phrase structure rules, including rules that use features, work fine for describing these cases.

Even for English, however, this is not universally true. There are many situations in which some element of an English sentence occurs in an unexpected situation, as shown by the examples in (5).

(5) a. She married the man who I introduced her to.

b. Him I liked, but I thought she was an idiot.

c. I believe with all my heart that she loves me.

d. On the bus sat an old man.

e. Betty, I believe, is a fool.

In each of these examples the boxed constituent is in an unexpected position. In (5a), the preposition 'to' would normally be followed by an NP, but the relevant NP, 'who', is WH-marked and has therefore been shifted to the beginning of the relative clause to mark its boundary; in (5b) the verb 'liked' would normally be followed by its object, namely 'him', but this has been shifted to the start of the sentence for emphasis; in (5c) the complement 'that she loves me' of the verb 'believe' has been shifted to the end of the sentence to avoid the potential ambiguity of 'I believe that she loves me with all my heart'; (5d) seems to be an example of a German 'verb-second' construction that happens to have survived in English, with the PP 'on the bus' moved to the front of the sentence for emphasis and the subject 'an old man' moved after the verb; and (5e) has been scrambled around to de-emphasise the fact this is just something I believe – 'I believe Betty is a fool' would describe the same state of affairs, but with the focus of attention on me rather than Betty.

It is extremely difficult to account for these constructions using a framework that states rules in terms of contiguous phrases, as in Figure 4, Figure 6 and Figure 7. It is also extremely difficult to adapt any of the parsing algorithms outlined above to cope with these cases.

Many computational treatments, particularly for languages like English where these constructions are regarded as being exceptional, deal with these phenomena by introducing the notion of '**slashed items**'. The idea here is that if you expect there to be an item of a specified kind at

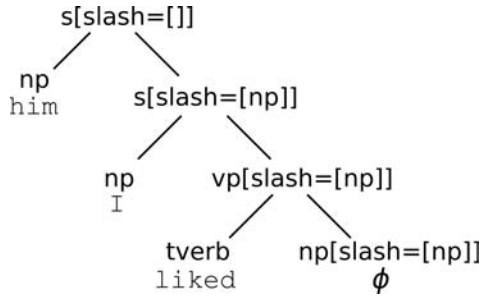

Figure 9 Using slash for handling extraposition.

some point in the text, but there is not one present, then you can hallucinate one. When you do this you have to remember that you have done so, by setting the value of a feature called **slash** to match the description of the item you were expecting. If you subsequently find such an item, you can 'cancel' the slashed item with it. The tree in Figure 9 illustrates this for the first part of (5b).

In Figure 9 an NP was hallucinated after 'like' to satisfy the requirement that this verb should be followed by an NP. The fact that this NP was just a hallucination was marked by adding it to the list of slashed items. Then when 'him' was encountered adjacent to a sentence that was marked as 'missing' an NP, it was used to fill in the gap.

This way of handling out-of-place items is widely used within computational treatments of language. The advantage of proceeding this way is that it can be done without any extension to the basic framework. It requires a few extra rules, shown in Figure 10, but once we have these rules the existing algorithms will work unchanged.

The first rule in Figure 10 says that you can introduce an item of type X anywhere you like (the rule has an empty right-hand side, so that there is no need to find the items that make up the right-hand side). The second and third say that if you have an item of type X next to an s which is missing an X then you can use it to fill the hole.

This provides a way of coping with out-of-place items without changing the nature of the formalism. Obviously there need to be constraints on what kinds of things can be hallucinated, and where they can be found, but there is nothing new in the form of the rules in Figure 10, and hence no need to change the algorithms that we use for applying them.

The problem is that as written there are absolutely no constraints on the rule that licenses the introduction of slashed items, which means that they will be introduced all over the place. Thus while we have not changed the formalism, and hence not had to change the algorithms, we are likely to have made the processing a great deal slower.

A number of ways of dealing with this have been suggested. Johnson and Kay (1994), for instance, suggested that you should only introduce slashed items if there is an item of the appropriate kind already available to cancel it. Using 'sponsors' of this kind is helpful for dealing with left-shifts, since most parsing algorithms work from left to right. If such an algorithm has not already found a potential item to fill a hole then there is no point in positing a hole, since it will never be filled.

This approach, however, cannot be used for cases of right-shifts (as with the complement of 'believe' in (5c) and the subject of 'sat' in (5d)). Furthermore, it turns out that stating the constraints on what can or must be shifted in languages with free-word order becomes very difficult if all examples of out-of-position items are described using the rules in Figure 10. It is, for instance, difficult to capture the constraint that Arabic subjects can only occur in front of the verb if they are definite, or that the scrambled form of (5e) can only occur if the embedded clause has no complementiser.

People working on languages with comparatively free word order have therefore often tried to use dependency grammar as a way of analysing the structure of a text. **Dependency grammars** specify relations between words

```
[cat=X, slash=[cat=X]] ==>
[cat=s, slash=[]] ==> [cat=X], [cat=s, slash=[cat=X]]
[cat=s, slash=[]] ==> [cat=s, slash=[cat=X]], [cat=X]
```

Figure 10 Slash introduction and elimination.

rather than between phrases, as shown in the analysis in Figure 11 of 'Betty, I believe, is a fool'.

The key here is that 'is' was found as the head of the complement of 'believe', without necessarily worrying about its own complements. It is always possible to induce a phrase structure tree from a dependency tree, simply by finding the dependents, so you can put constraints on local subtrees if you need to, but the crucial relationships are between words.

This makes it easier to deal with languages where items frequently turn up in non-canonical positions. Grammars based on a phrase-structure backbone, such as LFG, GPSG and HPSG, assume that a text will consist of a number of self-contained phrases occurring in a fixed order and then introduce complex machinery for managing cases where this is not what happens. This extra machinery can undermine the effectiveness of the algorithms described above, so that if the language allows a great deal of freedom (as is in fact commonly the case) this approach becomes unattractive. Dependency grammar starts out by expecting things to turn up in a range of positions. Effective algorithms for parsing with dependency grammar do often induce local sub-trees and inspect their properties, but the fact that grammatical relations are assumed to be between words rather than phrases does make it easy to cope with non-canonical orders.

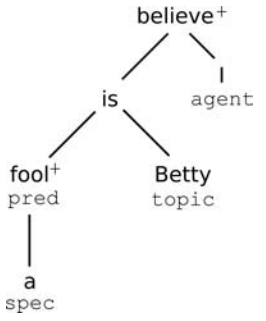

Figure 11 Dependency tree for 'Betty I believe is a fool'.

Ambiguity

In the end, however, even the best parsers are faced with the fact that most sentences have multiple possible syntactic structures. This is a particular problem for computational linguistics, since most computational applications require the system to choose among the competing analyses. Computational systems need to know not just what analyses are *possible*, but which one is *right*. Consider, for example, (6):

(6) a. I saw the man in the park.
    b. I saw the man with a big nose in the park with a pond in the middle.

(6a) has two interpretations – one where what I saw was the man who was in the park, the other where the seeing took place in the park (Figure 12).

In (6b), it is hard for a parser to decide whether it was the man that had a big nose or that I used a big nose to see him, or whether it was the man or the nose or the seeing that was in the park, or … Any grammar that allows PPs to attach to either nominals or VPs will assign forty-two analyses to this sentence. Some of them will be absurd (you cannot use noses to see people with, so any interpretation that attaches 'with a big nose' as a modifier of 'saw the man' should be ignored) and many will be equivalent (if I saw him and he was in the park then the seeing almost certainly also took place in the park). But detecting that an interpretation is absurd is not normally viewed as part of grammar, and nor is assessing whether interpretations are equivalent. Making these decisions can be difficult – realising that normally when you see someone who is in the park then the whole event will have taken place in the park, but that if you use a telescope to see them then it might not, require considerable understanding of what seeing is like and what telescopes can be used for. Nonetheless, any system that is going to react appropriately to an utterance will have to make the right choice, and as with the relationship between morphology and syntax noted above, the need to weave syntactic analysis and inference about likely interpretations together places extra constraints on the way you go about doing each part.

Semantics

If the goal of computational treatments of language is to construct computer programs that 'understand' natural languages, we have to find

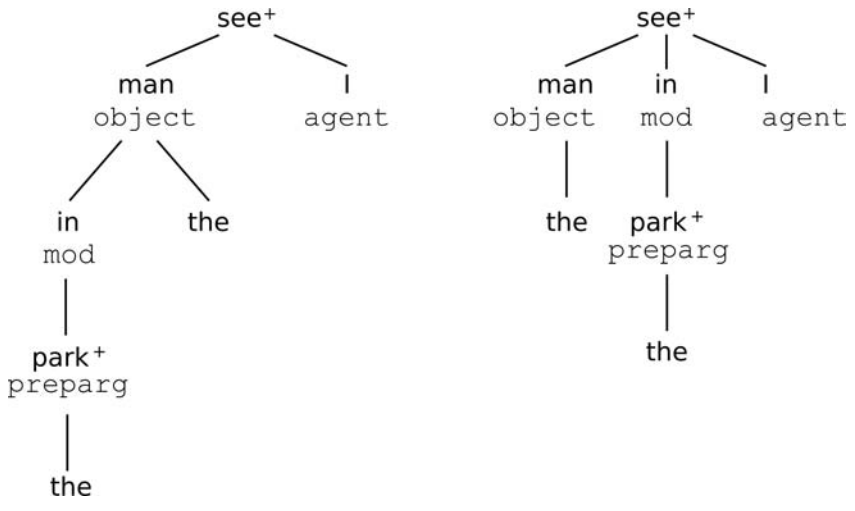

Figure 12 Dependency trees for (6a).

some way of representing meanings inside a computer. At first sight this seems like a very strange thing to do. To represent a 'meaning' inside a computer, surely we would have to know what meanings are, which is about as difficult a question as you could hope to find.

The key property of computational systems is that they do things. Given some input, they perform a series of operations and produce an output. So if we want to think about what is involved in getting a computer to understand a sentence of natural language, we should concentrate on what we would expect a person who understood it to be able to do. If a computer could do the same things, it would be hard to say that it had not understood the sentence. There might be some ineffable way in which the computer's and the person's understanding differ, but it would be at least a good start.

What can a person who understands a sentence of natural language do when they have understood it?

- They can inspect their model of the world to see whether the sentence fits it.
- They can determine whether it entails or contradicts some other sentence.
- They can use it to help them decide what do.

The first two of these are very closely linked. To see whether a sentence fits your model of the world you have to check that the sentence entails the existence of a set of entities e_i^s that match the set of entities e_i^m in the model, and that it also entails a set of relations $R_k^s(e_i^s, \ldots, e_j^s)$ that match the relations $R_k^m(e_i^m, \ldots, e_j^m)$ in the model. This holds no matter what kind of model you have. If the sentence entails the existence of a set of entities and relations that match the entities and relations in the model then it fits it, and if not then it does not.

Carrying out the first two tasks above, then, involves determining entailment relations. How can we get a computer to determine entailment relations?

We can represent formulae in a formal language in a computer as trees, much like the parse trees above for sentences in natural language. We can represent the formula `forall(B,human(B)→exists(C,mother(C,B)))` by the tree in Figure 13.

It is straightforward to express rules that operate on sets of trees of this kind, as in Figure 14.

Programs for applying such rules are fairly easy to write. Programs for applying them efficiently may be more challenging, but the idea that you can write programs that match trees against templates and use them to generate new trees should be unsurprising. So if we could use our analysis of the structural properties described above to build appropriate paraphrases in some formal language, we could then use inference

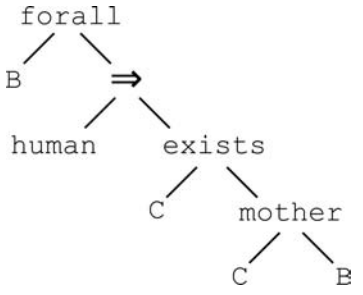

Figure 13 Parse tree for forall(B, human(B) => exists(C, mother(C, B))).

rules of the kind in Figure 14 to find out what they entailed.

There is a wide variety of formal languages to choose from. Some are more expressive than others, but there is a trade-off between the expressivity of a formal language and the ease of writing, and especially applying, sets of inference rules. Choosing which formal language to use depends on what you want a system to do. If the language you choose is very inexpressive then your paraphrases will miss some of the subtleties of natural languages, if it is very expressive then your inference engine will be very slow. It is common practice to use first-order logic as a reasonable compromise – fairly expressive, with plenty of easily accessible inference engines – but there are other possibilities, such as description logic (less expressive, with faster inference engines) and intensional logic (more expressive, slower inference engines).

We can thus implement the notion that understanding is related to the ability to draw inferences by constructing formal paraphrases and then using an inference engine. The details of how inference engines work are not part of linguistics, but the construction of formal paraphrases is.

Suppose that we had decided to use first-order logic as the formal language for our paraphrases, and that we thought that `love(j, m)` was a reasonable paraphrase of 'John loves Mary', with the constants `j` and `m` denoting the individuals denoted by the names 'John' and 'Mary' and love denoting the relationship of loving.

If that was right, then the paraphrase of 'Peter loves Mary' would have to be `love(p, m)`. Both sentences contain the verb phrase 'loves Mary', and both paraphrases match the pattern `love(?, m)`, so it seems that this pattern is the 'meaning' of the VP. We can reconstruct the original paraphrases by 'applying' them to the constants `j` and `p`, writing `love(?, m)·j` and `love(?, m)·p`. When we apply a pattern containing a `?` to a term, we replace the `?` by the term, so that `love(?, m)·j` becomes `love(j, m)`.

But if the meaning of 'loves Mary' is `love(?, m)`, then the paraphrase of 'loves Susan' would presumably be `love(?, s)`. The VPs both contain the word 'love', and the paraphrases both match `love(?, ?)`, so it seems that the meaning of 'love' is `love(?, ?)`.

At this point we have a problem. We want to apply this to the constants `j` and `m` and get back `love(j, m)`. Unfortunately `love(?, ?)` contains two `?`s. When we try to apply it to `j` and `m` we have decide which constant should be used to replace which `?`.

One way of doing this is to use variables rather than `?`s to mark the gaps. We can then precede any formula which contains variables by

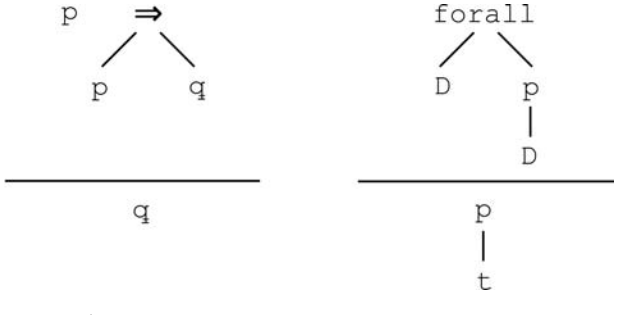

Figure 14 Inference rules as operations on trees.

a list which specifies which variable should be substituted first. Thus we could write `[X,Y:love(Y,X)]` as the meaning of 'love'. Then 'loves Mary' would be `[X,Y:love(Y,X)]·m`. We would replace the first element of the list of variables by the constant m, leading to `[Y:love(Y,m)]` as the meaning of 'loves Mary'. If we then apply that to `j` we would have `[Y:love(Y,m)]·j`, which becomes `[love(j,m)]`.

This idea originates with the work of Richard Montague (Montague 1974; Dowty et al. 1981). Montague used a language called the 'λ-calculus' which allows you to specify the items that are missing from an expression as λ-variables, so that instead of writing `[X,Y:love(Y,X)]` we would write `lambda(X,lambda(Y,love(Y,X)))`. Expressions of the form `lambda(X,P)` are called λ-abstractions, following the way that the expression `lambda[X,love(X,m)]` abstracts out the common part of `love(j,m)` and `love(p,m)`.

Montague's work contained two important insights:

1. **λ-abstractions** can be given an interpretation as sets. If John and Peter are the only people who love Mary, we can see that the `set{j,p}` is exactly the set which produce true sentences from the abstraction `lambda(X,love(X,m))`. So by a sleight of hand we can say that this abstraction is the same thing as the set. This is satisfying, since it enables us to talk about the meaning of any word, even words like determiners and prepositions which do not point to tangible entities. Every word has a λ-abstraction as its meaning, and every λ-abstraction denotes a set (though some words, such as determiners, may denote rather strange kinds of sets!).
2. To a very large extent you can assign a single λ-abstraction to each word, and a single λ-abstraction to each rule of your grammar, and you can then construct a formal paraphrase by applying the abstractions associated with the rules to the meanings of the items that are combined by these rules. This principle is known as the **Principle of Compositionality** (PC): 'the meaning of the whole is determined by the meanings of the parts and their mode of combination.'

PC is particularly important from a computational point of view, since it corresponds very closely to the notion of **modularity** in computer science. A computer system is modular if it is made up of components which can be glued together without having to be carefully tuned and modified every time they are used. Suppose for instance that you wrote a program for spotting and diagnosing grammatical errors in written text. You might want to include it as part of a number of other systems – as part of a word processor, and as part of an email tool, and as part of an instant messaging service, and … It would be extremely inconvenient if each time you wanted to reuse it you had to rewrite large parts of it. Modular design means that programs can be reused anywhere you like, without requiring changes and without requiring the person who wants to re-use them to understand how it works. The PC has a similar function, since it says that you just have to specify the meaning of each word and rule once. It doesn't matter where the word is used, it has the same meaning, which can be used unchanged in any context where the word can appear.

PC makes it possible to build formal paraphrases of arbitrarily complex sentences. If you can parse a sentence you can build a formal paraphrase, since at each point in the parse tree you can build a paraphrase of each of the daughters and then glue them together. Building the formal paraphrase in Figure 15 for 'I met the man who she saw in the park', for instance, involved building a paraphrase of 'who she saw in the park', but once that was built combining it with the meaning of 'man' was no more difficult than combining the meaning of 'old' and 'man' would have been.

There are, however, a number of challenges to PC. First, some surface forms have multiple meanings, e.g., 'bank' in 'I keep my money tied up at the bank/I keep my boat tied up at the bank', and some sentences have multiple readings even though none of the individual words do ('He saw the girl with red hair'). It is clear, however, that the problem here is that we have multiple words with the same surface form, or multiple possible modes of combination. Simple

cases of ambiguity like these are not a challenge to PC as a principle, though they do mean that it may not always easy to see how it should be applied.

More significantly, there are cases of sentences which have multiple interpretations but which do not seem to contain either lexical or structural ambiguities.

(7) a. i. John is looking for a unicorn. It was in the castle garden this morning, but it seems to have escaped.
ii. John is looking for a unicorn. Don't tell him they're mythical – he'll go on looking for hours.
b. Someone is mugged every ten minutes in New York, and he's getting pretty sick of it.

The follow-up sentences in (7a) seem to indicate two different readings of the main sentence. In (7a) (i) it is clear that there is some specific unicorn which he is looking for, in (7a) (ii) it is clear that there isn't. There is no obvious source of ambiguity in the main sentence, but there appear to be two interpretations. Similarly, the follow-up sentence in (7b) often provokes a conscious double-take as the reader realises that the writer is talking about a specific person who is continually being mugged, rather than suggesting that for each period of ten minutes it happens to some, probably different, person. The experience of having to backtrack and choose a different interpretation suggests that there are a number of ways of reading this sentence, but again there is no obvious source of ambiguity in the text.

The presence of '**underspecification**' of this kind has provoked a great deal of computational work. Systems that are going to react in some way to a text or an utterance are going to have problems with texts with multiple meanings. They will have either to choose between them, or to find some way of proceeding without making a choice (or at least of delaying making a choice for as long as possible). Both of these are difficult: to make the right choice can require very substantial amounts of background knowledge (and inference about that background knowledge), but deciding whether or not an ambiguity can be ignored can also be complex. Compare, for instance, (8a) and (8b).

(8) a. I saw the man in the park.
b. I saw the man with a telescope.
c. I saw the man with black hair.

In (8a), 'in the park' could attach to either 'man' or 'saw', but it makes very little difference which decision is made, since if I saw a man who was in the park then the seeing event almost certainly took place in the park; and if there was a seeing event in the park then the thing that was seen was almost certainly there too. In (8b), on the other hand, if the telescope was with the man then I am very unlikely to have used it for seeing him with, and vice versa. Spotting that it does not matter which interpretation to use for (8a) is at least as difficult as realising that you cannot use black hair to see with, so that 'with black hair' in (8b) probably attaches to 'man' rather than 'see'.

The other problem with PC is that it is not always possible to parse the input text. This could be because of inadequacies of the grammar being used (no one has yet written a complete computationally tractable grammar of any human language) or because the text is in fact

```
∃B : {past(now,B)}
     ∃Cevent(C,meet)
       &θ(C,object,ref(λD(man(D)
                          &∃E : {past(now, E)}
                                ∃Fevent(F,see)
                                  &θ(F,object,D)
                                  &θ(F,agent,ref(λG(centered(G,λH(f(H))))!5)
                                  (&in(F,ref(λ!(park(1)))!8) & aspect(E,simple,F)))f2)
       &θ(C,agent,ref(λf(speaker(f)))!0
       &aspect(B,simplePast,C)
```

Figure 15 Formal paraphrase of 'I met the man she saw in the park.'

ungrammatical. There are ways of recovering from these situations, but they can arise, and they will cause problems for any system that tries to use PC for constructing formal paraphrases. Nonetheless, PC does form the basis for almost all attempts to deal with 'meanings' computationally. There are numerous choices of formal language to use for paraphrases, there are numerous ways of dealing with ambiguity and out-of-coverage texts, but behind nearly every system you will find PC.

Pragmatics

Sentences are not naturally occurring objects that the linguist finds lying about in the landscape. Sentences are produced by people, in contexts, for reasons. If we want to write computer programs that do appropriate things when they encounter fragments of language we have to pay attention to this. Just as parsing is only a step on the way to constructing a meaning representation, so constructing meaning representations is only a step on the way to devising an appropriate (linguistic or extra-linguistic) response. A system that went into the kitchen and put the kettle on in response to (9) would be much more useful than one that just constructed an internal representation of the meaning.

(9) I'm dying for a cup of tea.

To work out how to respond to an 'utterance' (i.e. a sentence produced by a writer or a speaker in a context) you have to do three things.

1. You have to understand the relations between utterances. People very seldom produce isolated utterances. Texts are almost always made up of extended sequences of sentences, and spoken dialogues also generally contain numerous sentences. It is crucial that anyone trying to deal with such an extended sequence of sentences has a map showing them how the various ideas encoded by the individual sentences are related. It turns out that textual and spoken language, and monologues and dialogues, all make use of very similar cues to help the participants navigate their way around. We will therefore use the term 'discourse structure' to refer to the organisation of any sequence of utterances, no matter whether they are realised as text or speech or whether they are produced by one person or by several. We will look at techniques for analysing discourse structure which have a particularly computational flavour in the following subsection.
2. You have to fill in the gaps. Human language-users make very strong assumptions about what the people they are communicating with are likely to know, and they leave out any detail that they are confident that their readers/hearers are likely to be able to infer. This is particularly evident in stories. A story where every last detail of every event is spelt out in detail will be extremely boring. However, if what people say leaves large amounts of information implicit, a system that has to respond to what it is told will have to be able to reconstruct the missing parts. This is crucial for effective language processing. It is also, however, outside the scope of anything that could reasonably be called linguistics. Language has to link up to general knowledge in some way, and that's about all that can be said about it. There is a body of work on how to represent episodic knowledge of the kind required for understanding stories, starting with Schank and Abelson (1977), which leads on to a range of knowledge representation techniques, but we will not explore this further here.
3. You have to know why the person who produced the utterance did so, and hence infer what they might want you to do. That does not mean that you should automatically do what they want, but in order to work out what you should do it is crucial that you know what the other person wants you to do. We will return to this below.

Discourse structure

Extended discourses (sequences of spoken or written utterances produced by one or more speakers/writers) convey large numbers of ideas. If these ideas are just produced in a big jumbled pile they will be much harder for the participants to manage than if they are grouped into manageable chunks.

Just what those chunks should contain, and how they should be organised, depends on the function of the discourse. A story is likely to consist of episodes, where each episode presents a sequence of actions performed by a single character. An encyclopedia article on computational linguistics, on the other hand, might consist of sections each concerned with a particular level of linguistic description. Whatever the nature of the chunks, though, it will rely on very much the same devices for dividing the discourse up and specifying the relations between elements.

The shape of a discourse is encoded in three ways.

1. There are explicit divisions into chapters, sections and paragraphs with clear typographic markers. These are more common in texts than in speech, though they do have spoken correlates. These do not pose any specific challenges to computational approaches to language.
2. There are cue words which indicate relations between consecutive elements of a discourse – words like 'moreover', 'however', 'anyway' and so on.
3. There are devices for marking which items are currently the centre of attention, including the use of marked word orders and decisions about the way that known items are referred to.

Computational approaches to explicit discourse markers have generally taken Mann and Thompson's (Mann and Thompson 1988; Mann 1999) '**rhetorical structure theory**' (RST) as a starting point. The idea here is that in a coherent text most sentences are somehow connected to their neighbours – that a text will, for instance, introduce a claim and then attempt to support it, or provide a general description of an item and then make it more precise, or …

Suppose we let a '**basic discourse unit**' (BDU) be a simple clause. We could look for pairs of consecutive BDUs which were related to one another. Any such pair would convey a coherent package of information, i.e. it would contribute an element of the information carried by the entire discourse. So we could treat a linked pair of BDUs as a **general discourse unit** (DU), and we could look for links between consecutive DUs. With any luck we would be able to continue this process until we had covered the entire discourse, at which point we would have a view of its overall structure.

This process can be carried out most easily where there are explicit markers. In (10a), the cue words 'however' and 'hence' indicate very clearly which DUs are connected and what the relations between them are. It is notable, however, that (10b) expresses virtually the same package of information, with the same relations but without an explicit link between the failure and its cause.

(10) a. John studied hard for the Java exam. However, he wasn't very good at programming, and hence he failed it.
b. John failed the Java exam. He studied hard for it, but he wasn't very good at programming.

It turns out that identifiable indicators of this kind are comparatively rare. They are commoner in academic texts than in most other genres, but even in the last three paragraphs above there are ten sentences but just three clear markers ('for instance', 'so' and 'however'). There are other items which provide useful hints, but unambiguous markers are rare and ambiguous ones don't reliably lead to clear analyses. There has been a considerable body of work attempting to use machine learning techniques to analyse rhetorical relations (Marcu and Echihabi 2002) with varying degrees of success.

The relations between elements of a discourse are also marked by the form and position of NPs, particularly definite NPs. Consider (11) (from Grosz et al. 1995).

(11) a. i. John went to his favorite music store to buy a piano.
ii. He had frequented the store for many years.
iii. He was excited that he could finally buy a piano.
iv. He arrived just as the store was closing for the day.
b. i. John went to his favorite music store to buy a piano.
ii. It was a store John had frequented for many years.

iii. He was excited that he could finally buy a piano.
iv. It was closing just as John arrived.

Grosz et al. note that (11a) is more coherent than (11b), and argue that the problem is the repeated switching of the centre of attention between John and the store. Their argument is that well-constructed discourses tend to concentrate on one entity at a time, and that the choice of how to refer to an entity provides a strong clue about whether it is the current 'center of attention'. This is clearly related to the well known theme/rheme distinction (Hajicova and Sgall 1984; Halliday 1985), but Grosz et al. introduce the notion that is not just the position of an item but its referential form that matters. The underlying principle is that each utterance *Ui* in a discourse makes a number of entities available as potential centres of attention ('**forward-looking centers**', $C_F(Ui)$. The next utterance *Ui+1* may then refer back to one of these: the most prominent item in *Ui+1* that appears in $C_F(Ui)$ is the '**backward-looking center**' of *Ui+1*, $C_B(Ui+1)$. The referential form of $C_B(Ui+1)$ and its position in $C_F(Ui)$ provide strong hints about the shape of the discourse: the simplest situation is that $C_B(Ui+1)$ is in fact the same entity as $C_B(Ui)$, and that it is realised in *Ui +1* as a pronoun. Other cases can easily arise, e. g., where $C_B(Ui+1)$ and $C_B(Ui)$ are not the same as happens in (11b), where the centre keeps switching between John and the store. One particularly interesting case arises when $C_B(Ui+1)$ and $C_B(Ui)$ are the same, but *Ui+1* uses a definite NP instead of a pronoun for this item. This can be used to indicate that although the discourse is still focused on the same item, it is now being discussed from a different point of view. This is particularly noticeable in extended written texts, where the first sentence in a new paragraph will generally use a full NP to refer to the current center of attention even if was the backward-looking center of the last sentence in the previous paragraph.

Centering theory has received considerable attention in computational treatments of language because it supports algorithms for finding the antecedents of anaphoric pronouns (Brennan et al. 1987; Strube and Hahn 1999; Passoneau 1998). This is a major practical issue for computational systems, since it is not possible to respond sensibly to a turn in a discourse unless you know what the definite NPs that it contains point to. Centering theory provides an account of the relationship between the structure of a discourse, the use of various forms of referring expression, and the entities denoted by such expressions, and hence has proved to be an extremely fruitful topic in computational linguistics.

Speech acts

The mechanisms discussed in the previous subsection make it possible to break a discourse into chunks, and to determine the information flow within a chunk. We are still left with the problem of what the other person wanted when they produced their utterance, and what we should actually do.

Choosing a sequence of actions which will lead to a desired outcome is a very general problem, one which has been studied since the very early days of artificial intelligence. As soon as people started trying to build robots the problem of getting a machine to decide what actions to perform arose.

In order to solve this problem, you have to manage two things. You have to decide how to represent actions, and you have to develop algorithms that can explore the effects of different sequences of actions and match them to your goals. Fikes and Nilsson (1971) took the view that what matters most about an action is the conditions under which it can be performed (its '**preconditions**') and the changes that it will bring about (its '**effects**'), and that the effects can be split into things which will be made true by the action (its '**add list**') and things that it will make false (its '**delete list**'). The **STRIPS (Stanford Research Institute Problem Solver)** notation has formed the basis of virtually all work on planning ever since it was first presented.

Fikes and Nilsson were particularly concerned with developing a robot that had a simple hand which it could use for picking things up, moving them around, and putting them down again. Its basic abilities involved grasping and ungrasping an object, raising and lowering the hand and moving it around. These actions have very simple preconditions and effects. Figure 16, for

instance, says that you can grasp something if your hand is empty and the thing you want to grasp has nothing on it, and that once you have grasped it you will be holding it and your hand will no longer be empty.

Numerous algorithms for linking such actions together have been developed (Stefik 1981; Sacerdoti 1974; Kambhampati 1997; Blum and Furst 1997), and the basic formalism has been extended in a number of ways (e.g., by investigating the relationship between it and modal logic (Chapman 1987)), but the basic notion that actions can be described in terms of their preconditions and effects remains at the core of AI planning theory.

Linguistic acts are, at this level, just like any other acts. People produce linguistic acts because they have goals which they want to achieve. The goals that linguistic acts are aimed at usually involve other people, and their preconditions and effects are often concerned with what those other people know or believe. Nonetheless it seems plausible that the STRIPS formalism, and the algorithms that have been introduced for manipulating it, may be applicable here as well.

This idea has been very widely explored, usually by attempting to cast Searle's (1969) set of speech acts within this framework (Allen and Perrault 1980; Cohen and Perrault 1979; Cohen Levesque 1980; Appelt 1985). Take, for instance, the act of informing someone of something. You might describe this action by saying that you can only inform someone of something if you know it and if you believe that they do not know it; and after you have done so, they will also know it (see Figure 17).

The idea that you can describe speech acts using this approach is very attractive. If it were possible to do so, then the extensive literature on planning and plan recognition could be exploited to link linguistic actions to other kinds of actions, and hence to explain why someone might say 'I'm dying for a cup of tea' as part of a plan for quenching their thirst. It turns out that linguistic acts have a number of special properties that make it very difficult to apply standard planning algorithms unchanged. In particular, the preconditions often depend on propositions about the hearer's knowledge and belief which are not directly accessible to the speaker, so that the speaker cannot actually determine whether they hold; and the consequences often seem to involve some kind of mutuality, which is again very difficult to handle. Bunt and Black (2000), Bunt (2000) and Field and Ramsay (2007), for instance, contain various attempts to circumvent these problems whilst remaining within the general paradigm.

Language engineering

Principles

If you could provide an efficient implementation of all the theories discussed above, then, you would have a computer system that could freely communicate using natural language.

Well, not quite. When you come to try to apply these theories to large bodies of free text or speech you encounter a new range of problems. Faithful implementations of linguistic theories of this kind fail to work as well as you would like for a variety of reasons:

```
grasp(X)
preconditions: handEmpty, clear(X)
add: holding(X)
delete; handEmpty
```

Figure 16 STRIPS description of grasping a block.

```
inform(X, Y, P)
preconditions: know(X, P), believe(X, not(know(Y, P)))
add: know(Y, P), know(X, know(Y, P))
delete: believe(X, not(know(Y, P)))
```

Figure 17 STRIPS description of X informing Y that P.

- Everyday language contains a variety of special constructions which have their own sets of rules – dates, proper names, lists, mathematical formulae, tables, etc. These constructions do generally have well-defined structures, but they are different from the rules of general language, and they need to be dealt with separately.
- Most texts contain production errors. This is obviously true of spoken language, but it is also true of very large amounts of written material. Newspaper article and web pages, for instance, contain very large amounts of extremely useful information, but they are very often written in a hurry and without a great deal of post-editing. As such, they often contain material that is perfectly comprehensible to a human reader but which fails to conform to the rules of 'correct grammar' (whatever that might be).
- Full implementations of the theories discussed in the previous section tend to be fairly slow. As computers get faster and implementations get cleverer this problem is decreasing, to the point where it is reasonable to hope that we will soon have systems that can process language about as fast as people speak. Applications which aim to extract information from very large corpora, however, need to run much faster than that. There is a great deal of interest in using the web as a source of general information. Current search engines can be used to find texts that might contain the answers to various kinds of question, especially 'factoid' questions. Googling 'Who was Henry VIII's fourth wife?', for instance, leads you directly to a set of pages which contain the required information. 'Why did Henry VIII destroy the Church of England?', on the other hand, leads to a page entitled 'Why did Henry VIII destroy the Catholic church at (sic) England?', which is a very different (albeit more sensible) question. Systems which try to extract information have to be extremely fast, since they have to search through hundreds of millions of words of text to find what they need, and it is unlikely that thorough implementation of the theories discussed in the previous section will attain the required speed in the near future.
- Full implementations of these theories are in any case very difficult to build. Wide coverage parsers, large lexicons with detailed information about syntactic properties, detailed definitions and knowledge bases are all just very hard to make.

Systems that aim to cope with these problems have to be slightly less ambitious about how much of the information that can be carried by well-written grammatically conformant text they will try to extract. If you cannot rely on the text to be grammatical in the first place, then maybe you should not spend a great deal of effort looking at fine-grained grammatical distinctions. If you cannot provide detailed axiomatisations of the 40,000 distinct open-class items in the British National Corpus (BNC) [*see* CORPUS LINGUISTICS], then maybe you should not spend a great deal of time writing theorem provers that can cope with detailed axiomatisations of lexical items. (The BNC is a collection of 100 million words of written and spoken English, from a variety of genres, which has been semi-automatically annotated with part-of-speech tags. When it was constructed it was by some way the largest available such corpus, and although it has now been overtaken it is still very widely used.) 'Language engineering' is concerned with developing systems that can do something useful when confronted with material that is very poorly written, or mixes standard language with 'non-linguistic' material, or is simply too large to be dealt with by tools that very closely embody standard linguistic theories.

Corpora and resources

Such approaches place great emphasis on data of various kinds. First, they assume that looking for patterns in very large corpora is a sensible way to find out about language. This not to say that classical post-Chomskyan linguistics is not rooted in an analysis of data, but it is a very different kind of analysis. There is no doubt that grammaticality judgements on critical pairs of sentences, for instance, are a very valuable form of data, and that theories that arise from consideration of this kind of data are crucial in understanding how language works. On the other hand, knowing that 27 per cent of NPs in

the BNC have 'the' as their determiner, 19 per cent are bare plurals, (about) 29 per cent are bare singulars, 11 per cent have 'a' or 'an' as their determiner, and the remainder have a variety of other determiners is also extremely useful information when you are trying to work out which aspects of quantification are most important. (It is hard to count bare singulars because of examples like 'for example', where it is unclear whether 'example' is a noun or is a bare singular NP.) Because language engineering is very largely concerned with extracting information from large, often messy, bodies of text, it seems sensible to pay attention to data relating to large messy bodies of text.

Much of this information is obtained automatically. As we will see below, you can often use very simple rules to extract slightly less simple information from a corpus, and doing so will let you use very large corpora indeed. The idea that the World Wide Web itself could be treated as a corpus is under active consideration by a number of groups. Whilst this raises a number of interesting questions about what constitutes a corpus, given the ever-changing nature of the web and the difficulty of deciding when a page should be treated as being representative of some particular language, it does give some indication of the level of ambition of these projects.

At the same time it is recognised that there remain a number of aspects of language that, for the moment at least, require some degree of manual intervention. It is almost impossible, for instance, to see how you could automatically infer the difference between vegetarians and vegans from a corpus, or that you could work out that forgetting that you have done something entails that you have done it whereas forgetting to do it entails that you haven't. It seems as though this kind of information has to be provided explicitly. Providing it on a very large scale, however, is extremely hard work. There has therefore been a considerable emphasis on developing a variety of resources which contain this kind of information, to be reused as required. Some of these resources are freely available, though given the effort that is required for their development it is understandable that some providers ask for payment. Free or not, these resources facilitate the development of systems that can carry out tasks that would otherwise be impossible. They generally embody fairly simple theories. **Wordnet**, for example, which is probably the best known and most widely used such resource, is mainly used as a taxonomic classification of word senses. As such it might not appear to represent much of a theoretical breakthrough. It turns out that having a list of 150,000 words linked to 200,000 senses, where the senses are organised into a subsumption hierarchy, lets you think about questions that would never have arisen otherwise. Thus although the idea that words have multiple senses, and that these senses form a hierarchy, does not seem very startling the consequences of actually having such a classification are far-reaching.

Machine learning

Managing these quantities of data requires techniques from outside the standard linguistic toolbox. In particular, using ideas from machine learning is extremely fruitful. The first thing that strikes you when you try working with this kind of data is how unruly it is – full of unexpected constructions, with surprising patterns of usage. To take a simple example, consider the words 'eat' and 'devour'. At first sight these seem to be near synonyms. A typical dictionary definition of 'devour', for instance, might contain the paraphrase 'eat; eat like a beast or ravenously' as the principle definition (Concise Oxford Dictionary, 6th edition, 1979). Looking up uses of the word 'devour' in the BNC, however, shows the following list of nouns occurring as its object: 'books, volumes, novels, father, lives, stags, candles, plants, insect'. On the reasonable assumption that the words that a verb can take as its object provide some indication of its meaning then 'devour' seems to have more in common with 'read' than with 'eat'.

It is of course possible to explain this mismatch between the expected use (and the primary dictionary definition) and the actual use in terms of metaphorical extension, and my dictionary goes on to provide secondary glosses as 'engulf (of fire etc.); take in greedily with ears or eyes (book, story, beauty or beautiful person)'. It does, however, seem perverse to give priority to the interpretation which has the least support from this fairly substantial corpus. There is no doubt

that historically 'devour' is closely related to 'eat', but knowing what a word means now is rather more useful than knowing what it used to mean.

In general, this kind of analysis involves finding patterns of usage – which nouns follow 'devour', what is the commonest part-of-speech tag for 'that', what is the commonest kind of word before a noun, etc.? (33% determiners, 25% adjectives, and then a wide range of others: all the probabilities quoted in here are drawn from the first one million words of the BNC and rely on the BNC tags.) The algorithms for doing this are derived from work on machine learning, which rests heavily on statistical methods. We will review some of these algorithms below.

Techniques

As in the second section, 'Computational Linguistics', language engineering involves processes that operate at different levels of description. The key difference between the algorithms described below and the techniques outlined in 'Computational Linguistics' is that language-engineering techniques accept from the outset that their results are likely to be wrong. Given that the kind of text being analysed is certain to contain production errors, as well as often just being too complicated for more linguistic methods to work in a reasonable time, the potential for making mistakes is built into the task from the start. This moves the goalposts: what we want now are systems that are fast and reasonably reliable. Accepting the inevitability of error opens the door to approaches to linguistic analysis that would not have even have been thinkable in a more classical setting.

Tagging

We start with part-of-speech tagging. There is very little you can do with language until you have at least decided what classes of word you are looking at. You can, perhaps, look for text containing sets of keywords, but this is a very blunt instrument when you want to understand, rather than simply retrieve, texts. Before you can do any deeper analysis you need to assign words to classes.

There are two difficulties to be overcome here: first, many words are ambiguous. In the last sentence of the previous paragraph, for instance, the words 'can', 'need', 'to' and 'classes' all have multiple possible tags. Second, unless you have an absolutely enormous dictionary there will be words that you have not listed, and hence that you cannot assign part-of-speech tags to.

As Lewis Carroll noted, however, the local context often provides very strong clues to help you with this task:

(12) And the slithy toves did gyre and gimble in the wabe.

'Gyre' in this example is almost certainly a verb, since it follows 'did'; and then 'gimble' must also be a verb, since it is conjoined with 'gyre', and hence must have the same type. 'Wabe' must be a noun, since it follows a determiner and is not followed by anything else. 'Toves' must be a noun, since it is the last item in the NP before 'did', and then 'slithy' must be an adjective, since it comes between a determiner and a noun.

Not every case is as clear-cut as this, but then not every case has as many unknown words in as this. If you have a mixture of known and unknown or ambiguous words, you can use the information provided by the known words to help you decide about the unknown/ambiguous ones.

The first thing to do is to see what you can do by just looking at the words in the text. It may not be feasible to construct a dictionary that contains unique tags for every word that might occur, but that does not mean that there is not information that can usefully be recorded. In particular, it is sensible to record tags for closed-class items, since these can be assigned fairly reliably and they are extremely informative about the adjacent words (as in (12)).

It may not in fact always be possible to assign unique tags even to closed-class words ('to' may be a preposition or the head of a TO-form VP – 'I want to go to the park', 'that' may be a complentiser or a determiner or a demonstrative pronoun or a relative pronoun, and so on), but it is certainly worth recording what you do know about these words. What else you record depends on the time and effort you can afford to commit. You might decide to list information about particularly common words, since getting

common words right will have a disproportionate effect on the overall accuracy. You might decide to list information about the beginnings and endings of words: 47 per cent of English words beginning with 'imp-' are adjectives, 65 per cent of English words ending with '-ing' are verbs, and so on. The more information you record, the more likely you are to get the right tags just by looking at words in isolation. However, recording this kind of information is extremely labour-intensive and is itself intrinsically error-prone. Initially at least, the information has to be recorded by hand. This is a slow process and can only be done by people who have been given some training in the task. This is a common factor in data-intensive work. Someone has to go through the data and make judgements about it. This is slow and error-prone.

Assigning tags to words in isolation will inevitably lead to a degree of mis-tagging. To take a simple example, the best thing you can do with 'to' in isolation is to class it as a VP-marker, since 69% of the time that will be right. But then 31% of the time you will be wrong about it.

You can improve the situation by taking into account what you know about the tags of the surrounding words. If 'to' is followed by 'be' then it is probably a VP-marker, since 'be' is almost certainly an infinitive verb, and prepositions are very seldom followed by infinitive verbs. If it is followed by 'the' then it is probably a preposition, since 'the' is almost certainly a determiner, and the VP-marking form of 'to' is very seldom followed by determiners. Note that everything here is qualified by probabilities: almost anything you can imagine will happen somewhere, no matter how unlikely it may seem.

There are two standard ways of exploiting this information about the local context. The first is to try to make use of conditional probabilities. These are a key tool in language engineering. Suppose we let $p(H|E)$ denote the probability that the hypothesis H is true given that the evidence E is. In the current example, H might be 'the correct tag for 'to' in this sentence is PREP', and E might be 'the next word has the tag DET'. Then we can use Bayes' theorem:

$$p(H|E) = \frac{p(H) \times p(E|H)}{p(E)} \quad (\textit{Bayes theorem},\ V1)$$

In other words, if we know how likely the tag for 'to' is to be PREP in general ($p(H)$), how likely it is that this sense of 'to' is to be followed by a determiner ($p(E|H)$), and how likely a randomly chosen word is to be a determiner ($p(E)$), then we can calculate the probability that this occurrence of 'to' is a preposition. This theorem is particularly useful when we have multiple sources of evidence, e.g., if we knew how likely it was that the prepositional sense of 'to' followed a noun as well as how likely it was to precede a determiner. We can then use the following version of Bayes' theorem to combine these bits of information:

$$p(H|E_1\ \&\ E_2) \approx \frac{p(H) \times p(E_1|H) \times p(E_2|H)}{p(E_1) \times p(E_2)} \quad (\textit{Bayes theorem},\ V2)$$

The advantage of V2 is that the probabilities on the right-hand side are easy to collect (assuming, as noted above, that you have a tagged corpus already), so that you can calculate the probability of some hypothesis in a situation where you have not seen all the contributing evidence together before. The disadvantage is that it is only an approximation. There are conditions under which it does hold, but in almost any practical application these conditions are violated. You therefore cannot trust the numerical results that arise when you use V2, but you can usually trust it as a device for discriminating between alternative hypotheses.

Unfortunately, we cannot apply even V2 directly to the task of part-of-speech tagging. We would like to use the transition probabilities between different parts of speech (i.e. the likelihood that a word of one type is preceded/followed by one of another) to guide the search. The trouble is that the information we have about the preceding/following word is itself uncertain. There are a number of ways of allowing for this. The commonest strategy is to use a '**hidden Markov model**' (HMM), which is a device for combining all the current hypotheses about the previous word, together with the transition probabilities between it and

the current one, to adjust the current estimates for tags for the current word.

HMMs typically pay attention only to the tags and transitions probabilities for the previous word. They can be applied extremely quickly (as with the FST models in 'Morphology' above), but because they only look at the immediately preceding word they can miss important information. There are a variety of other statistical techniques for part-of-speech tagging, but there is also an approach which takes an entirely different view.

Suppose that you had a tagger that had assigned the sets of tags in Figure 18. It is clear that the tags in (2) and (4) for 'to' are wrong. What do the surrounding contexts for these have in common that distinguishes them from the surrounding contexts for (1) and (3)? That in (2) and (4) the word 'to' is followed by a verb.

We could therefore introduce a rule which said 'If you've labelled the word 'to' as a preposition, but it's followed by a verb, then relabel it as a VP-marker'.

Given a large text which had an initial tagging of this kind, there would be many potential rules of this kind. The idea behind '**transformation-based learning**' (TBL) (Brill 1995) is that you scan the entire text collecting such rules, and you choose the one that produces the greatest net benefit (a single rule might change things that are already correctly labelled, thus making things worse, as well as fixing some that are currently wrong: the best rule is the one where the positive changes outweigh the negative ones by the greatest margin). You then apply this rule to the entire text and start the process again. At the end you will have a collection of rules, each of which embodies a specific contextual constraint. It is important that these rules are applied in the order in which they were learnt, since some of them are only there to patch errors introduced by others.

The advantage of this approach is that rules can look at a variety of locations in the context, so that a much bigger window can be inspected. Learning rules seems at first sight to be a very expensive process, but there are efficient implementations of the learning algorithm. It is worth noting that this approach can easily be combined with others, since it is essentially a mechanism for learning about the errors that other taggers make. It is therefore perfectly feasible, and productive, to use a TBL-based tagger as a post-processor for one that uses, for instance, an HMM.

Chunking and shallow parsing

Part-of-speech tagging by itself can be useful, but it is more commonly used as a pre-processing step on the way to finding (and labelling) larger groups of items. It is, as noted earlier, a crucial step before attempting to produce a syntactic analysis of the kind described in 'Syntax' above. However, as we saw in 'Syntax', producing a full syntactic analysis is a time-consuming task, and grammars that provide descriptions of the full range of phenomena in a language nearly always produce large numbers of analyses of individual sentences. Is there something faster and more reliable, albeit possibly less detailed, that we can do?

You could look for small groups of words that can be reliably linked. If you have a determiner followed by an adjective and a noun, you can be reasonably sure that they go together. If you have an auxiliary followed by an appropriate form of a verb, you can be reasonably sure they go together. You might not be able to account for all the words in a text in this way, but finding recognisable chunks is certainly better than just having isolated words.

The obvious way to do this is by writing a grammar for recognising groups. Consider the rule in Figure 19 (where ? means '0 or 1 occurrences of an item of this kind', * means '0 or more items of this kind' and + can be used to mean '1 or more items'):

This rule by itself would pick out the groups 'The obvious way', 'a grammar' and 'groups'

```
1  hePro    wentVERB    toPREP    theDET      park
2  hePro   wantedVERB   toPREP    goVERB    homeNOUN
3   IPRO    sentVERB     aDET   letterNOUN   toPREP   theDET  bankNOUN
4   IPRO  expectedVERB  toPREP    seeVERB    himPRO
```

Figure 18 Initial tagging for transformation-based learning.

```
NP ==> det? adj* noun* noun
```

Figure 19 Regular expression for simple noun chunks.

from the first sentence of the previous paragraph. This is a useful first step on the way to breaking this sentence into parts. Note that these are not the NPs that a full grammar would find, since the subject of 'is' in this sentence is 'The obvious way to do this' and the object of 'writing' is 'a grammar for recognising groups'. Finding these more complex NPs, however, requires a great deal more work: to account for 'a grammar for recognising groups', for instance, your grammar has to allow you to treat present participle VPs as NPs, and it has to have an attachment strategy that lets you attach the PP 'for recognising groups' inside the NP rather than to the VP 'writing a grammar'. As just noted, grammars that can cover this are hard to write, slow to process, and tend to produce large numbers of analyses. Grammars made up of simple rules like the one in Figure 19, on the other hand, are fairly easy to write, can be processed extremely quickly, and do not produce multiple analyses.

The pattern on the right-hand side of the rule in Figure 19 is a '**regular expression**'. The language of regular expressions lets you specify patterns in terms of disjunctions and repetitions of symbols drawn from a fixed set of terms. (It is also possible to include a restricted set of negation operators.) Such patterns can be converted into finite-state networks, which we have already noted can be processed very quickly. However, the fact that we have to specify patterns using a fixed set of terms means that it is not possible to define recursive relations using them. You can define a pattern for a simple preposition phrase, as in Figure 20; but you cannot define a rule for describing how PPs can be used to modify nominal or verbal groups, because the pattern would have to use the term from the left-hand side of the rule in its right-hand side, and that is just not possible within this framework. Similarly, it is not possible to describe sentences whose main verbs have sentential complements, or relative clauses, nor is it possible to give a reasonable account of long-distance dependencies or other marked word orders.

As such, chunking can provide more information than simple part-of-speech tagging, but it is inevitably less useful than complete syntactic analysis.

Surprisingly, the techniques that are used for tagging can be applied directly to chunking. Suppose we introduce some new tags, `bnchunk`, `inchunk`, `bvchunk`, `ivchunk`, and `ochunk`, where bnchunk means 'This word is at the Beginning of an Nchunk' and `inchunk` means 'This word is Inside an Nchunk', and likewise for Vchunks, and `ochunk` means 'This word is Outside any chunk'. Then you could use your favourite tagger to assign these tags, instead of the more traditional ones, and you could use the rules in Figure 21 to form groups.

Flat semantics

Since chunking does not, and cannot, lead to complete syntactic analysis then it cannot be used to produce a detailed semantic analysis. Nonetheless it can be used as the basis for semantic representations which can in turn be used for a variety of practical tasks.

As we saw above, most meaning representations for natural language assume that sentences typically depict events, where the general event type is specified by the verb and the other ele-

```
PP ==> prep det? adj* noun* noun
```

Figure 20 Regular expression for simple PPs.

```
nchunk ==> bnchunk, inchunk+
vchunk ==> bvchunk, ivchunk+
```

Figure 21 Regular expressions for chunks.

ments supply entities that are somehow involved in the event. Suppose we have a verb chunk and a collection of NP chunks. We can assign a set of roles for participants in the event denoted by the verb of the main verb in the verb chunk, and we can then try to assign the NP chunks to these roles.

For simple sentences this will work fine. We can tell fairly easily whether the verb chunk is active or passive, so we can work out the mapping between syntactic and semantic roles. Most sentences will be in canonical order (e.g., SVO for English) – after all, if SVO were not the commonest order for English sentences we would hardly regard it as being canonical! We can therefore allocate NP chunks to roles by working from left to right, assigning the first NP chunks to the role associated with the subject and subsequent chunks to the remaining roles. Any material that has not been included in any chunks will be ignored, but then any material that is not a core element of an NP chunk or a VP chunk is likely to be circumstantial and hence ignoring it is fairly safe.

If the text is complex, including things like relative clauses and PPs, then we are likely to have a number of NP chunks that do not correspond to slot fillers in the main verb. Consider (13)

(13) $[\text{The man}]_{N_1}$ $[\text{whose wife}]_{N_2}$ $[\text{you}]_{N_3}$ $[\text{met}]_{V_1}$ $[\text{in the pub}]_{P_1}$ $[\text{has been working}]_{V_2}$ $[\text{at my office}]_{P_2}$.

A chunker that could find NP, PP and verb chunks might divide this sentence up as shown. Working out which of the Ni is the subject of each of the Vj is not straightforward, and will require some further set of rules of some kind. There is yet again a trade-off between the amount of work you want to do and the detail and accuracy that you can expect in your meaning representation. Finding the chunks in (13) can be done very quickly, but because the syntactic relations between these chunks have not been specified, building an accurate meaning representation from them may be difficult.

Lexical relations

You cannot do much with language unless you know what words mean. Spelling out what words mean, however, is an extremely difficult and time-consuming task. In a perfect world we would have a collection of rules in some formal language which spelt out all the relations between the words of our language (or, better, between the concepts that they denote). The trouble is that encoding all the links between words would ultimately require encoding all the commonsense knowledge of a typical human being, which is simply not feasible (see Lenat and Guha 1990 for a description of an attempt to do exactly that). Wordnet (Fellbaum 1998) provides taxonomic relations between a fairly large set of (senses of) lexical items, but it would be good to have other kinds of relations.

Is there any way of obtaining information about relations between words automatically? Consider the following set of words: 'alfalfa, algae, amount, animal, ants, apples, arthropods, babies, balls, banana, barley, beans, beef, berries, birds, biscuit, blackbirds, …, day,…, grub, habits, hamburgers,…'. What do these words have in common?

By and large, they stand for things that can be eaten. The list is an extract from the list of nouns in the BNC that occur as objects of the verb '*eat*'. As such it should not be too surprising that they stand mainly for things that are edible. It is in fact more surprising that any of them do not.

We could infer that the words in this list form a semantically connected set, namely 'words for things that can be eaten'. If we knew anything about eating, e.g. that most things that you can eat are derived from living organisms, then we could infer that these things are living organisms (so we could infer, for instance, that arthropods were living organisms), so that linking up semantic classifications of this kind with hand-coded knowledge about specific words could be used to support quite complex inference about texts containing a wide range of words.

This is a very simple variation on the idea that words that appear in similar contexts are likely to have something in common. In the example above, we are assuming that words that appear in identical contexts (e.g. as the object of the same verb) are likely to have something in common. If you can develop a more general notion of 'similar contexts', you might be able to get more interesting classes. You could, for instance, obtain a similarity measure for nouns

by counting how often they occurred as objects of the same verbs. You could then use this measure to determine whether two verbs were similar by checking whether they have similar nouns as their objects, and then perhaps use this to determine whether nouns are similar by checking whether they occur as the objects of similar verbs and...

This kind of approach has been extensively explored, e.g. Pantel and Lin (2000) used patterns of noun-preposition-noun verb-preposition-noun triples to compute similarity measures between nouns and between verbs, and then used these to help decide between alternative PP attachments. There are a number of potential pitfalls. Firstly, you need a great deal of data before anything interesting emerges, but extracting significant relations from large bodies of data is very difficult. The list of objects above, for instance, was extracted from the BNC by using the regular expression '`verb det? (adj|noun) *noun`', which looks for occurrences of a verb followed by a noun group (i.e. by an optional determiner, a series of adjectival and nominal modifiers and a final head noun).

This seems like a reasonable enough pattern, but it picked up 'Especially in the early weeks of the diet, eating habits are very similar to the old ways', leading to the inclusion of 'habits' as an object of 'eat'. This kind of problem is extremely difficult to avoid: in order to extract information from very large corpora, you need to use very fast algorithms, which in turn require you to use fairly simple formalisms, e.g. regular expressions. But it is not possible to write regular expressions which pick out all and only the cases you want, so you will inevitably either make mistakes like the one here or miss out on some genuine examples.

Second, experiments of this kind show that figurative/metaphorical uses of language are extremely widespread, so that at the very least you have to be aware that the patterns you will get for words that were expected to have similar meanings will have much less in common than you might think. The objects that occur with 'devour' shown above, for instance, suggest that in contemporary usage this word has more in common with reading than with eating. Nonetheless, if you are wary of such traps then this kind of approach can lead to the automatic discovery of lexical relations that would otherwise require a huge amount of manual effort.

Computational linguistics vs. language engineering

Language engineering, then, bears the same relation to linguistics that other branches of engineering bear to their underlying scientific discipline: 'the application of science and mathematics by which the properties of matter and the sources of energy in nature are made useful to people' (Merriam-Webster Online Dictionary). Computational linguistics lies somewhere between linguistics and language engineering. Computational linguistics has two, slightly conflicting, motivations: it aims partly at articulating linguistic theories in a computational setting, in the hope that this will lead to advances in understanding, partly by enforcing greater precision (because programs just do not do anything unless every detail is spelt out) and partly by providing new descriptive tools; but it also aims to use the computational versions of linguistic theories to produce practical tools. Language engineering, on the other hand, is prepared to work with fairly gross approximations of linguistic theories if these can be made to work faster or more robustly. The result is that computational linguistics leads to tools that can respond very precisely in very restricted domains, whereas language engineering tools are more approximate, but can be used with a wide range of texts and text types.

A. M. R.

Suggestions for further reading

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Contrastive analysis/contrastive linguistics

'Contrastive analysis' and 'contrastive linguistics' are terms generally used synonymously for **cross-linguistic studies** involving a systematic comparison of two or more languages with a view to describing their similarities and differences. As a linguistic enterprise, contrastive analysis is 'aimed at producing inverted (*i.e.* contrastive, not comparative) two-valued typologies (a CA is always concerned with a *pair* of languages), and founded on the assumption that languages can be compared' (James 1980: 3). Contrastive analysis traditionally has an applied perspective, branching into translation studies as well as language pedagogy. However, contrastive analysis may also be more theoretically orientated, e.g., by investigating how a universal category X is realised in languages A and B (Fisiak 1981: 2). Contrastive/cross-linguistic studies are not dependent on any particular theoretical framework. However, they tend to involve only a small number of languages, typically a pair, in contrast to studies of universal grammar or language typology.

Any fruitful comparison presupposes that the items compared have something in common (cf. Krzeszowski 1995: 9). A central concern of contrastive linguistics is thus that of identifying an appropriate ***tertium comparationis***, i.e. a 'third term' that can provide a frame of reference for the comparison. Various types of *tertia comparationis* have been suggested and used: formal (similarity of form or of grammatical categorisation), semantic (similarity of meaning) and functional (similarity of communicative purpose, genre etc.) (see Chesterman 1998). Particularly in connection with the use of parallel corpora (see below), the notion of translation equivalence has been advocated as a *tertium comparationis* (James 1980: 178; Johansson 2007: 3).

The contrastive analysis hypothesis

Contrastive methods have a long history in linguistics (e.g., Weil 1844; Mathesius 1935/1961), and Krzeszowski (1995) gives examples that go back to the Renaissance. **Contrastive analysis** as a branch of applied linguistics, however, was developed in the USA in the 1940s and 1950s (see e.g., Fries 1945 and Lado 1957). The motivation for this work was foreign-language teaching and the development of teaching materials: 'The most efficient materials are those that are based upon a scientific description of the language to be learned, carefully compared with a parallel description of the native language of the learner' (Fries 1945: 9); 'in the comparison between native and foreign language lies the key to ease or difficulty in foreign language learning' (Lado 1957: 1). Such a view of the role of contrastive analysis gave rise to the strong version of the **contrastive analysis hypothesis** (Wardhaugh 1970); i.e. the belief that difficulties in learning a language can be predicted on the basis of a systematic comparison of the system of the learner's first language (its grammar, phonology and lexicon) with the system of a second language. A weaker version of the contrastive analysis hypothesis is based on 'evidence of language interference' (Wardhaugh 1970: 123) and is thus related to **error analysis**.

The influence of the first language on the learning of a second is generally referred to as **transfer**. Transfer may be positive in the sense of helping the learner, or it may be negative, if the learner erroneously applies structures from their L1 in the new language. In the latter case it is often called **interference** or **negative transfer**. For example, if a lexical item in the new language closely resembles one in the native language, the learner may transfer their understanding of the term's meaning to the new language, and this may be helpful to them in the learning process. However, the strategy may backfire in the case of **false friends**, terms in two languages which are phonologically and/or graphologically similar (**cognates**), but have more or less subtly different meanings. For example, the Norwegian term *eventuell* means 'potential' (like its French cognate *éventuel*), not 'final', so that a discussion in an English L2

classroom of 'an eventual disaster' may not be as ominous as it sounds. The double-edged nature of L1 influences on L2 learning was noted by such giants in the history of foreign-language teaching as Sweet (1899/1964: 54ff.) and Palmer (1917/1968: 33ff.), but it was in the 1950s that the influence of the mother tongue on second-language learners became a major issue in language teaching theory, boosted by the publication of Weinreich (1953), Lado (1957) and Haugen (1953). In the USA, interest waned in the 1970s, whereas in Europe it survived albeit with an emphasis on a weaker version of the **contrastive analysis hypothesis**. According to this weaker version, *difference* between languages (Ringbom 1987: 47, quoting Wardhaugh 1970: 126) does not 'predict difficulty'; it 'requires of the linguist only that he use the best linguistic knowledge available to him in order to account for observed difficulties in second language learning'.

Error analysis

Error analysis is complementary to contrastive studies in that 'contrastive studies predict errors, error analysis verifies contrastive predictions, *a posteriori*, explaining deviations from the prediction' (Fisiak 1981: 7). The object of error analysis is 'to systematically describe and explain errors made by speakers of a foreign language' (Johansson 1975: 10). The assumptions are that many errors are made on the basis of the learner's first language and that the combination of error analysis and contrastive analysis will provide a basis for improving language teaching. Error analysis was particularly popular in the 1970s (see e.g., Svartvik 1972; Richards 1974). Corder (1967, 1973) emphasises language learning rather than teaching, and moreover introduces a distinction between **errors**, which are systematic, and **mistakes**, which are due to performance factors. Error analysis obviously has its limitations in relation to contrastive studies: not all errors can be explained by reference to the learner's first language, and divergences between the language of foreign learners and that of native speakers may be due to other factors than straightforward errors, such as avoidance of difficult structures. Furthermore, it does not take account of what the learner gets right. Error analysis was therefore widened to a more general study of learner language, or **interlanguage**.

Interlanguage analysis

The theory of interlanguage posits that the language competence of a learner at any stage represents 'a systematic attempt to deal with the target language data' (Schumann 1974: 145). In spite of deviances from a native speaker norm, interlanguage thus represents a genuine linguistic system. The idea was first broached by Nemser (1961/1971) and Brière (1964/1968), but it is best known through the work of Selinker (e.g., 1992, 1996).

Interlanguage competence is of three types: **fossilised competence**, **functional competence** and **transitional competence** (Selinker 1996: 97). The notion of fossilised competence derives from Corder (see Selinker 1996: 98). The idea is that many L2 learners appear to reach a plateau in their learning where they cease to improve any further; i.e. where their interlanguage system has stabilised (Selinker 1992: 262). The dynamics of the learning process is reflected in the term 'transitional competence' (cf. Corder 1967): learners on their way to a higher level of proficiency, with their interlanguage systems 'still under construction'. Some learners achieve competence in restricted domains only, enabling them to use the new language mainly for specific purposes, and it is this kind of competence that Selinker refers to as 'functional competence', a notion originally from Jain (1969, 1974).

Selinker (1996) retains the idea of L1 influence in his claim that there is firm evidence that L2 learners' preferred learning strategy is the search for **inter-lingual identifications**, a notion derived from Weinreich (1953/1968) (Selinker 1996: 97).

More recently the study of interlanguage has been extended to corpus-based research. A good example is the International Corpus of Learner English (ICLE) based at the Centre for English Corpus Linguistics in Louvain-la-Neuve, Belgium (see Granger 1998). This corpus comprises texts written by advanced learners of English

from a large variety of L1 backgrounds. The corpus is studied in its own right or in conjunction with a control corpus of comparable texts by native speakers of English. Central terms in this type of investigation are **overuse** and **underuse** (learners use a word or construction significantly more or less frequently than native speakers do in comparable contexts). Moreover, the term **misuse** tends to be preferred to that of 'error'. Comparisons can also be made of output from learners of different L1 backgrounds to investigate what features of interlanguage are due to L1 transfer and which ones have other sources. This type of comparison is referred to as **contrastive interlanguage analysis** (cf. Granger 1996). A similarly modelled corpus of spoken learner English is also being compiled: The Louvain International Database of Spoken English Interlanguage (LINDSEI) (Granger 2004).

Corpus-based contrastive analysis

A way of ensuring the empirical basis of contrastive analysis is to use machine-readable corpora. Multilingual corpora are of three principal kinds:

1. **comparable corpora**, in which texts in two or more languages are matched for certain features such as genre, age and medium;
2. **translation corpora** consisting of original texts in one language with translations into at least one other language;
3. **parallel corpora** which combine the other types by containing comparable original texts in at least two languages, each with translations into the other language(s) (see further, Johansson 2007).

While types (2) and (3) lend themselves to **translation studies**, contrastive studies are best served by types (1) and (3), given the special features of translated texts (see Steiner 2004) and the misgivings voiced by some linguists about basing contrastive observations on translated material (for a summary see Mauranen 2005). A translation corpus will ensure a *tertium comparationis* through translation equivalence. However, a comparable corpus has the advantage of not being limited to texts that have been translated.

The parallel corpus model (type 3) was developed first in connection with the **English-Norwegian Parallel Corpus** held at the universities of Oslo and Bergen, Norway, and the **English-Swedish Parallel Corpus** held at the universities of Lund and Göteborg, Sweden (see Johansson and Hofland 1994; Aijmer et al. 1996; Johansson and Oksefjell 1998). To be fully operational, the model requires the alignment of original and translated text units and software for parallel concordancing. Such a bidirectional translation corpus then 'makes it possible to distinguish between language differences and translation effects' (Johansson 2007: 12) in that features of translated texts can always be checked against comparable original texts in the same language and within the same corpus. Corpora similar to the English-Norwegian Parallel Corpus now exist for other language pairs such as German–Norwegian, English–French, and English–Spanish. The bidirectional corpus model has been extended to three languages in the Oslo Multilingual Corpus (English–German–Norwegian) and can in principle comprise any number of languages, though in practice the extent of such an enterprise is severely limited by the availability of translated texts.

Within parallel corpus research it has become common to talk about **correspondences** rather than 'translations'; most importantly the relation of correspondence is bidirectional so that a word or phrase in a source text has a correspondence in the translation and vice versa (Johansson 2007: 23ff). In many ways correspondence is a more inclusive concept than 'translation' in that it includes **zero-correspondence** as well as so-called non-congruent correspondence between non-equivalent categories, such as the translation of a noun by an adjective. See the following example from the Oslo Multilingual Corpus, where the Norwegian original and the German translation contain modal particles (*vel/doch wohl*), the English translation contains a modal auxiliary as a non-congruent correspondence, while its alternative (not taken from the corpus) has zero correspondence for the modal particle.

Og det var vel ikke meningen? (KF1)
Und das ist doch wohl nicht gemeint?
And that couldn't be what you meant? (KF1T) /

And that was Ø not what you meant?

The integrated contrastive model

The coupling of corpus-based contrastive analysis with corpus-based interlanguage analysis seems a fruitful avenue at the current stage of contrastive analysis (see Granger 1996; Gilquin 2003). The integrated contrastive model inherits its motivation from the weak version of the contrastive analysis hypothesis and from error analysis. The methodology presupposes the existence of a parallel corpus and learner data, preferably in both of the languages compared. Results of a contrastive analysis based on the parallel corpus can give rise to hypotheses about interlanguage while on the other hand features of overuse, underuse or misuse in the learner corpus can be an impetus to contrastive studies. Research along the integrated contrastive model so far has shown that L2 learning difficulties are not related to differences between L1 and L2 in a simple way. An example of an interfering factor may be the perceived distance between constructions: if the learner perceives corresponding constructions as very different they will not confuse them (cf. Gilquin 2003).

H. H.

Suggestions for further reading

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Conversation analysis

Background

Conversation analysis (CA) is an approach to the study of language in conversation and other types of **synchronous interaction** (often referred to as talk-in-interaction). The approach originally developed in sociology, but now plays an important role in linguistics as well. Some linguists using methods from CA, refer to their endeavour as '**interactional linguistics**' (e.g., Selting and Couper-Kuhlen 2001). This article focuses on CA from a linguistic perspective. It therefore also covers work done under the heading of interactional linguistics, even though some interactional linguists may not subscribe to all the methodological principles of CA.

The founder of CA, **Harvey Sacks**, was a sociologist who was inspired by '**ethnomethodology**', a sociological approach focusing on the practical methods with which members of society make sense of everyday life and construct, maintain, or challenge social order (Garfinkel 1967; Heritage 1984). In the 1960s, Sacks started studying basic conversational patterns in recordings of talk in different settings that he happened to get access to. His findings and methods were first communicated through lectures (published posthumously in Sacks 1992a, 1992b). In the late 1960s and through the 1970s, a series of articles by Sacks, and his collaborators, Gail Jefferson and Emanuel A. Schegloff put CA on the map (Jefferson 1972, 1973, 1974, 1978; Jefferson et al. 1987; Sacks 1972a, 1972b, 1974, 1978; Sacks and Schegloff 1979; Sacks et al. 1974; Schegloff 1968, 1972, 1978, 1979; Schegloff et al. 1977, to mention a few), and since then the method has become influential in general and applied linguistics, communication studies, social psychology, pedagogy, anthropology, cognitive studies, and sociology.

Principles

CA researchers always use recordings of interaction as the starting point for analysis. The recordings are transcribed with a set of **transcription conventions**, developed by Gail Jefferson (see Atkinson and Heritage 1984: ix–xvi; Jefferson 2004). The conventions use – normal or adapted – standard orthography and aim at

high precision with regard to the timing of speech and other events, including overlapping talk and silences, and some aspects of prosody. The researchers then look for possible regularities in the behaviour of interactants, and having found a 'candidate phenomenon', they try to develop an account of how interactants use this phenomenon in systematic ways. CA research is mainly descriptive; researchers focus on showing *how* things get said and done rather than *why*.

Some basic insights guide researchers using CA methodology. One is that no phenomenon can *a priori* be deemed insignificant or unsystematic. This has led to discoveries concerning phenomena which are often ignored in linguistics, such as, for instance, the grammatical systematicity of repair and other dysfluencies in talk (see below), or the orderliness of **laughter** (cf. Glenn 1995; Jefferson 1979, 1984, 1985; Jefferson et al. 1987).

Another insight is that interactants continuously show each other how they understand what was said in the immediately preceding utterance (Sacks 1987). This display of understanding is a principal source for the analyst in interpreting actions and utterances in interaction. In connection with this, CA researchers stress that utterances are '**doubly contextual**'; they must be understood on the basis of what has come before, and they create a new context for what comes after (Heritage 1984).

The notion of **context** is important in CA, but it differs from the way context is often understood in pragmatics, sociolinguistics [*see* PRAGMATICS; SOCIOLINGUISTICS], anthropology or sociology. The very fact that somebody can correctly be labelled 'doctor', 'patient', 'working class', 'middle class', 'woman', 'man', 'second language speaker', etc., does not in itself guarantee that such identities are relevant for the interactants. The context taken into account in a CA study is what interactants treat as important, or as it is often expressed in CA literature, the context which conversation participants 'orient to' (Schegloff 1991).

Turn-taking and grammar

A basic unit in talk-in-interaction is the '**turn-at-talk**' (or just '**turn**'), i.e. one conversational contribution from one speaker. Each turn consists of one or several '**turn-constructional units**' (or **TCUs**), for instance, a sentence, a clause, a phrase, or a word (Sacks et al. 1974). At the possible ending of every TCU, another interactant may start speaking. This basic fact of interaction is fundamental for linguistic aspects of utterance construction. A simple example (Sacks et al. 1974: 721 [26]) shows how:

Ken: I saw 'em last night [at uhm school.
Jim: [They're a riot

Jim begins talking in overlap with the last part of Ken's turn (as indicated by the square brackets). This may seem interruptive, but if we look at how Ken constructed his turn, we can see that Jim begins talking when Ken's turn is both syntactically and pragmatically potentially complete. Grammatical structures make it possible for Jim to predict – or 'project' – this point before it occurs. Such **projection** takes place incrementally, i.e. bit by bit in real time: upon hearing the subject and predicate ('I saw'), an object is projectable. That object ("em') turns out to be something which does not provide new information and the turn so far can, thus, not be a complete contribution to the conversation. Therefore, some additional element providing such information is projected. The adverbial 'last night' is precisely such an element, and Jim now treats the turn as potentially complete. It turns out that Ken has more to say, but the new increment ('at uhm school') gets overlapped by Jim as he starts to speak at the TCU's first projected completion point.

Cross-linguistic research indicates that all languages have dependency features which facilitate projection of possible turn completion before its actual occurrence. But languages differ as to the relative role of syntactic, morphological, prosodic, and pragmatic cues (see Ford et al. 1996 on English; Kärkkäinen et al. 2007 for an overview; Schegloff 1996 on English; Steensig 2001 on Danish and Turkish; Takana 1999, 2000 on Japanese).

Self-repair and grammar

CA research has shown that '**dysfluencies**' or '**false starts**', both falling into the category of

'**self-repair**' in CA, are far from random. When people halt their utterance production to recycle something, replace it with something else, change the projected structure, or search for a word, this has specific interactional functions and different structural properties in different languages. Recycling words or syllables can for instance be used as a way to fight for the turn in overlap situations (Schegloff 1987) or to request that co-participants look at the speaker (Goodwin 1981).

Languages use different '**repair indicators**'. For repair of an item that has already been uttered, many languages use a '**cut-off**', an abrupt stop in phonation (often a glottal stop), marked in CA transcriptions with a hyphen ('-'). But languages in which the glottal stop is a phoneme may use other devices to indicate repair (Schegloff 1979, 1987).

Self-repair can be a window into the ways speakers perceive the grammatical structures of a language. One example of this is '**morphological repair**', a phenomenon which Fox et al. (1996) found in Japanese interaction: an inflectional ending may get replaced with another, as in 'kurida[shi-] soo' ('go out'), in which the 'adverbial' ending ('shi') gets replaced with the 'cohortative' ending ('soo'). Speakers of English do not, however, repair a bound morpheme on its own, but repeat the whole word, with a new morpheme (not 'look[ed-] s', but '[looked-] looks'). The authors speculate that languages like Japanese, with an agglutinative structure in which bound morphemes show a good correspondence between form and function, may favour morphological repair.

Actions, sequences and 'preference'

Another basic unit in talk-in-interaction is the **action**. CA agrees with **Speech Act Theory** [*see* SPEECH-ACT THEORY] that all talk performs actions, but has a different understanding of how to analyse it. When determining which action an utterance carries out, the important factor is the immediate surroundings, i.e. the **sequence**. An example (adapted in an abbreviated version from Schegloff 1988) may show what is meant with this:

Mother: en I wanna talk ta you about where I'm going (t'night)
((some utterances left out))
Russ: *I* know where you're goin',
Mother: Where.
Russ: To the uh (eighth grade) =
Mother: = Yeah. Right.
Mother: **Do you know who's going to that meeting?**
Russ: Who.
Mother: I don't kn*o:*w.
Russ: Oh:. Prob'ly Missiz McOwen ('n detsa) en prob'ly Missiz Cadry and some of the teachers.

The mother has announced a topic, and Russ has displayed some knowledge about it, which the mother has confirmed. This means that the focus utterance occurs in a position where some sort of next initiative on this topic can be expected. The form of the utterance (interrogative) confirms that it does carry out an elicitative action; it is directed at Russ and demands a response from him. The utterance looks like a typical 'question', or request for either confirmation (that the recipient knows) or information (about who is going to the meeting). But this is not how Russ analyses it. He treats it in his response as starting a '**pre-sequence**' (Levinson 1983: 345–64), more specifically a **pre-announcement**, announcing that the mother knows and is going to tell. Russ's 'Who' is a typical next step in an announcement sequence, giving the turn back to the '**announcer**'. But it turns out, when the mother speaks again, that she doesn't know, and in Russ's next turn he consequently reanalyses the utterance as having been a question, and he answers it.

Russ's first analysis makes sense as it builds on a recurring sequence, the '**announcement sequence**' (Levinson 1983: 349–56; Terasaki 2004). Mother's does too, of course, seeing that the '**question–answer sequence**' is a well-known sequence. The import of this is that the function of utterances is understood in relation to the sequences in which they may occur, and that interactants' interpretations are a main resource to analysts when investigating the nature and definition of utterances as actions.

Many actions occur in pairs, socalled '**adjacency pairs**' (Schegloff 1968; Schegloff and

Sacks 1973), for instance, **question** and **answer**, **invitation** and **acceptance/rejection**, **request** and **granting/refusal**, etc. One feature of such pairs is that the production of a '**first pair part**' (question, invitation, request, etc.), makes it normatively expected that the appropriate '**second pair part**' (answer, acceptance/rejection and granting/refusal) should be produced by a selected next speaker immediately. In some of the second pair parts, there are alternative options, and in such cases, one of these options will be the '**preferred**' one (Levinson 1983: 332–45). If an answerer gives a 'dispreferred' response, it gets marked as such with hedges, hesitation markers and accounts. Furthermore, such responses are often delayed, which means that if an answerer waits a little before responding to a first pair part, this delay will often be interpreted as the beginning of a dispreferred response. In this way, the notion of **preference** and **dispreference** is not a question of what speakers intend, but a structural feature of responses, and something which can be observed in interactants' behaviour.

Concluding remarks

CA research covers a broader field than what is reported here, for instance, storytelling, verbal and non-verbal action, talk and technology, prosody, response tokens, connectors, assessments, accounts, the relationship between specific syntactic structures and action, etc. Much CA literature addresses research methodology, and CA researchers often address other approaches and vice versa. By now, CA covers all levels of linguistic inquiry and many topics of broader interest to linguists.

J. S.

Suggestions for further reading

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Corpus linguistics

Before defining corpus linguistics, one first has to define a **corpus**. At its most general, a corpus (plural *corpora*) is a body or collection of linguistic (textual) data for use in scholarship and research. Since the 1960s, interest has focused on **computer corpora** (or **electronic corpora)**, and the term **corpus linguistics** generally assumes the use of such corpora. However, in the first two sections below we begin by considering the place in linguistic research of corpora in general, whether they exist on paper or on an electronic medium such as a computer storage device. In the remaining sections, we consider why computer corpora have been compiled or collected; what are their functions and limitations; and what are their applications, for example, their use in **natural language processing** (**NLP**). For convenience, this article illustrates the field of computer corpora by focusing on one language that has been most studied by this

means – Modern English – although corpora have been built and exploited for research on many other languages.

The term **corpus linguistics** (in use since the early 1980s) is generally employed for linguistic research which depends on the use of computer corpora. As such, it is not so much a sub-discipline within linguistics as a methodology that can be applied to different areas of linguistics (syntax, lexis, pragmatics, etc.), albeit a methodology that has arguably brought about revolutionary changes in the way languages can be studied.

Corpora in a historical perspective

In philological research before the twentieth century, particularly on **dead languages** (languages no longer used for communication by a community of native speakers), the corpus of available textual data, however limited or fragmentary, was the foundation on which scholarship was built. Later, particularly in the 1900–50 period, corpora assumed importance in the study of extant languages, particularly languages previously unwritten and unstudied, including the **Amerindian languages** studied by linguists such as **Franz Boas** (1911) and the generation of American linguists who succeeded him. This development was particularly important in setting the scene for the key role of corpora in American structural linguistics. For **Bloomfield** (1933/1935) and the **post-Bloomfieldians** (see Harris 1951: 12ff.) the corpus was not merely an indispensable practical tool, but the *sine qua non* of scientific investigation. This era also saw a shift from the closed corpus of a dead language – necessarily the only first-hand source of data – to a closed and finite corpus of a **living language** (a language used as a means of communication in a present-day speech community), where lack of access to unlimited textual data is a practical restriction, rather than a restriction in principle. Another shift was from written textual data (in the case of a dead language) to the spoken data of a previously unwritten language. If we associate the terms 'text' and 'corpus', as tradition dictates, with written sources, this tradition in the post-Bloomfieldian era gave way to a contrasting emphasis on the spoken language. Nowadays corpora can consist of written texts, spoken material, or a combination of both.

A complete reversal of the American structuralists' reliance on corpora was effected by the revolution in linguistic thought inaugurated by **Noam Chomsky**. Chomsky has seen the finite corpus, whether spoken or written, as an inadequate or degenerate observational basis for the infinite generative capacity of human language (see Aarts 2001). For him, speaker intuitions replaced the corpus as the only reliable source of data about a language. It was in this unfavourable climate of opinion that the compilation of the first electronic corpus was undertaken in the USA. The **Brown Corpus** of written American English, consisting of approximately 1 million text words, was compiled in 1961–4 (see Francis and Kucera 1964; also Francis 1979). It contained 500 written text samples of c. 2000 words each, drawn from a systematically sampled range of publications in the USA during 1961. Since that time, electronic corpora have gradually established themselves as resources for varied research purposes, to be described below.

Justifying corpora in linguistics

In view of Chomsky's influential rejection of corpus data, we need to consider in what ways corpora contribute to linguistic research. So let us begin with six arguments against the Chomskyan view.

1. The opposition between the all-sufficient corpus of the post-Bloomfieldian linguist and the all-sufficient intuitions of the generative linguist is a false opposition, overlooking reasonable intermediate positions. Recent corpus users have accepted that corpora of first-hand textual data cannot be meaningfully analysed without the intuition and interpretative skill of the analyst, using knowledge *of* the language (as native speaker or proficient non-native speaker) and knowledge *about* the language (as linguist). Thus corpus linguistics is seen as using corpus *plus* intuition, rather than corpus *versus* intuition.
2. The generativist's reliance on the native speaker's intuition begs a question about the analysis of language by non-native speaking scholars. Such analysts often have deep

knowledge and reliable intuitions about what is possible in a language, and, especially in the context of present-day worldwide use of English, it is artificial to restrict information about a language to that provided by native speakers. It is no accident that English corpus linguistics has flourished in countries where a tradition of English studies is particularly strong, but where English is not a native language: for example, Germany, Japan and the Scandinavian countries.

3. The assumption that linguistics concerns competence, not performance, a cornerstone of Chomsky's linguistics of the mind, has been increasingly challenged since the 1960s, especially through the development of branches of linguistics for which detailed evidence of performance is key, such as sociolinguistics, pragmatics and discourse analysis. To these may be added developments in applied linguistics, where it has become clear that studies of how language *is used*, both by native speakers and by second-language learners, are relevant inputs to language learning.
4. The generative linguist's reliance on 'intuition' has required the postulation of an 'ideal native speaker/hearer' who speaks an invariant variety of the language in question (see Chomsky 1965). But **sociolinguistics** [see SOCIOLINGUISTICS] has highlighted the variability of the competences of different native speaker dialects and even the dialectal variability of a single native speaker. As the non-uniformity of the language is widely accepted as normal, it is evident that native speakers' knowledge of that language is incomplete, whether in terms of dialect or genre/register. For example, British native speakers obviously have unreliable intuitions about American usage, or about scientific or legal usage in their own country. (Good examples have been provided by various corpus-based studies of the English modal auxiliaries, notably Coates 1983; here corpus analysis reveals wide variation among various regional varieties of the language, and among different registers.)
5. Studies of corpora also bring to light an abundance of examples that cannot be neatly accommodated by intuition-based generalisations or categories. These cannot be dismissed as performance errors (see Sampson 1987): rather, they invite analysis in terms of non-deterministic descriptions of language, accommodating prototypes (Rosch 1978; Lakoff 1987), gradience (Aarts 2007) or fuzzy categories (Coates 1983). From the viewpoint of such theories, it is the linguist's intuition that is suspect, since the linguist who relies on intuition unsupported by evidence of language use is likely to find only clear-cut, prototypical examples to back up a given generalisation; or, in contrast, to find unrealistic counter-examples for which a corpus would provide no authentic support. Hence intuition may be seen not as a clear mirror of competence, but a distorting mirror, when used as the only observational resource for language study.
6. We turn finally to an argument more specifically in favour of computer corpora. The goal of NLP by computer must reasonably include the requirement that any piece of language to be processed should not be preselected by the linguist, but that any sample of naturally occurring English should be capable of analysis. Although this ambitious goal is beyond the capabilities of existing NLP systems in such complex tasks as machine translation, it motivates the increasingly indispensable role of computer corpora in computational linguistics [*see* FROM COMPUTATIONAL LINGUISTICS TO NATURAL LANGUAGE ENGINEERING], and shows that NLP, like other branches of linguistics mentioned in (3) above, cannot neglect the detailed study of performance, as manifested in authentically occurring textual data.

Limitations of corpora

On the other hand, the use of corpora is subject to clear limitations. The Brown Corpus (see above) illustrates two kinds of limitation often found in corpus linguistics.

First there is a limitation of size. Even though the million words of the Brown Corpus seem impressive by pre-computer standards, they represent only a minute sample of the written texts published in the sampled year of 1961, let

alone in a theoretically 'ideal corpus' of all texts, written and spoken, in Modern English.

The second limitation is a limitation of language variety. In the defining criteria of the Brown Corpus, 'written English' proclaims a limitation of medium; 'American English' one of region; and '1961' one of historical period. There is also a limitation of genre: some varieties of the written language, such as journalism, are included, whereas others, such as poetry, are not. Consequently any study of Modern English based on the Brown Corpus cannot be generalised, without hazard, to varieties of the language excluded from its sampling frame.

This generalisability of results is at the root of a problem corpus linguists debate of **representativeness** (see Biber 1993). With what degree of confidence can a sample of the language in use, which is all a corpus of a living language is, be considered representative of the language in general? It is true that the compilation of large and varied corpora – so called **reference corpora** – has advanced enormously since the Brown Corpus was created in the 1960s. But the Holy Grail of representativeness remains elusive.

Moreover, the limitations of corpus size means that samples provided in the corpus may be statistically inadequate to permit generalisation to other samples of the same kind. While the 1,000,000 words of the Brown Corpus may be considered enough for the study of common features such as core grammatical constructions, they are manifestly inadequate for most lexical studies, and more particularly for collocational analysis, for which a corpus approaching the size of the Bank of English (over 500 million words) is ideally required.

To some extent, however, the generalisability of findings from one corpus to another is itself a matter for empirical study. The list of the fifty most common words in the Brown Corpus is replicated almost exactly in corresponding corpora of British English (the **Lancaster-Oslo/Bergen Corpus** – known as the **LOB Corpus**) and of New Zealand English (the **Wellington Corpus**) – see Kennedy (1998: 98–9). In this very limited respect, then, these three corpora are virtually equivalent samples. As more corpora of different language varieties are compared, it will become evident how far a sample may be regarded as representative of a language variety or of the language in its entirety.

Why should a corpus be electronic?

An electronic corpus (also termed **machine-readable**) is more valuable than a corpus stored, in the traditional way, on paper for two fairly obvious reasons: it can be (a) automatically processed and (b) automatically transmitted.

Automatic processing includes operations that vary from the simple – such as sorting the words of a text into alphabetic order – to the complex, such as syntactic analysis (**parsing**) and semantic analysis. The computer's advantage over a human operative is that it can perform such tasks with great speed, as well as with consistent reliability. Thus the computer can accomplish operations of text manipulation that are totally impracticable for even large numbers of (trained) human beings.

Automatic transmission includes transferring a text either locally (e.g., from a computer storage device to an output device such as a VDU or a printer), or remotely to other installations – either via a direct electronic link or via a portable storage device, such as a CD-ROM. Thus, technically, a corpus can be 'published', i.e. can be copied and made available to users, in any part of the world, with the necessary computer facilities. As technological advances bring ever cheaper and more powerful computers, as well as ever greater and faster transmission possibilities, the computer corpus is becoming an everyday resource for a large body of users – not only for research in linguistics and language engineering but for applications in such areas as education, lexicography and translation. Nowadays many corpora can be accessed or downloaded from the Internet. Technical availability, however, does not mean availability in a legal or practical sense – see 'Availability limitations' in the next section.

Computer corpora of modern English: data capture and availability

What is available?

Still focusing on English, we now survey something of the range and variety of existing computer corpora. The **LOB Corpus** mentioned above (see Johansson et al. 1978, http://khnt.hit.uib.no/icame/manuals/lob/index.htm) is a corpus of published British English compiled to match as closely as possible the Brown Corpus of American English. The **Brown family of corpora** (a convenient name for a set of comparable corpora following the design of Brown and LOB) has proliferated, and includes corpora of Indian, Australian and New Zealand English. Of particular interest are two corpora compiled at Freiburg, known familiarly as the **Frown** and **F-LOB Corpora** (Leech et al. 2009) and consisting of text samples dating from 1991 to 1992. These match the Brown and LOB corpora, respectively, allowing a diachronic comparison over the thirty-year period separating the two sets of corpora. The newest member of the Brown family, known as **B-LOB** ('before LOB'), is a matching British corpus from the period 1928 to 1934, and a further British corpus from the period 1898 to 1904 is being compiled.

Corpora of spoken English are more difficult and time-consuming to create. A pioneering enterprise in this field was the **London-Lund Corpus** (Svartvik 1990) consisting of transcriptions from the **Survey of English Usage**, a pre-computer corpus developed by Quirk (see Quirk 1960), later computerised by Svartvik in Sweden. Recently the London-Lund transcriptions have been reused, together with spoken data from the ICE-GB corpus (see below) to create the **Diachronic Corpus of Present-day Spoken English** (**DCSPE**) (http://www.ucl.ac.uk/english-usage/projects/verb-phrase/index.htm), a corpus of spoken British English covering roughly the same thirty-year period as LOB and F-LOB, and therefore enabling comparisons to be made between changes in spoken and in written British English between the early 1960s and the early 1990s.

A comprehensive corpus should, of course, contain both spoken and written material. A project combining both media, initiated by Greenbaum in the late 1980s and already well advanced, is the **International Corpus of English** (**ICE**) (Greenbaum 1996). Like the Brown family, ICE consists of a set of 1-million-word corpora of matching design, each with 60 per cent spoken and 40 per cent written material (http://www.ucl.ac.uk/english-usage/ice/index.htm). The first of these corpora to be completed was **ICE-GB**, the British incarnation of ICE, but several corpora from other English-speaking countries and regions have also been issued: from East Africa, India, Hong Kong, New Zealand, the Philippines and Singapore – and more are in preparation. As can be guessed from these examples, the ICE plan is to create a range of corpora as an observational basis for comparison of native or nativised varieties of English used across the world.

All the corpora so far mentioned are no larger than a million words. Much larger than these are the 100-million-word **British National Corpus** (**BNC** – http://info.ox.ac.uk/bnc) – dating from the 1990s – and the already-mentioned **Bank of English**. These 'second-generation corpora' or 'megacorpora' were created primarily for lexicography but have innumerable other uses. Another important area of advance has been the development of historical and dialectal corpora, a research programme associated particularly with the University of Helsinki since the earlier 1990s. Corpora of spoken English have also proliferated, now including many more specialist and regional corpora: two American corpora deserving mention here are the **Corpus of Spoken American English** (see Chafe et al. 1991 – a relatively small corpus but with detailed transcription) and the **Michigan Corpus of Academic Spoken English** (MICASE) (http://quod.lib.umich.edu/m/micase), which is downloadable or searchable online.

Seventeen smaller corpora of varied types (including members of the Brown family) are available on CD-ROM as the **ICAME Collection of English Language Corpora**, available at a reasonable cost from the ICAME site at the University of Bergen, Norway (http://nora.hd.uib.no/humdata/3–91/icame.htm). **The Linguistic Data Consortium** (**LDC**; http://www.ldc.upenn.edu) based at the University of Pennsylvania is another corpus provider, distributing data from a large and growing archive

of corpus resources of varied kinds – not only corpora of various languages, but associated software, annotated datasets, etc.

This selective survey shows only the tip of the iceberg: there exist hundreds of more specialised corpora, representing particular historical periods, dialects, genres of speech and writing, etc. Nor are age-groups neglected – two examples, the **CHILDES Database of children's language** (http://childes.psy.cmu.edu), and the **Corpus of London Teenage English** (**COLT**; see Haselrud and Stenström 1995) can illustrate this immense variety, growing year by year.

The proliferation of new and larger corpora is due to improved possibilities of **data capture**. In fact, since the Brown Corpus came into being in the 1960s, the possibilities of obtaining texts in electronic form have increased astronomically. The Brown and LOB corpora had to be laboriously keyboarded and corrected by a human operator using a device such as a card punch or (later) a terminal. But the 1970s and 1980s saw the development of computer typesetting and word-processing, processes by which vast quantities of electronic text have come into existence as a by-product of commercial text-production. Other sources of automated data capture are the World Wide Web and the use of **scanners** and/or **OCR**s (optical character readers) which can scan pages of text and automatically convert them into electronic text form. With such resources, it is now possible for an individual to build a corpus for personal research purposes.

Automatic data capture means that, in principle, corpora of unlimited size can be created. There is consequently a move away from the idea of a fixed, closed corpus towards data capture as an open-ended, ongoing process. Diachronically, this trend is illustrated by the **American Corpus** of Mark Davies of BYU, Utah (from 1990 to 2007). Such corpora, searchable online, are extensible into the future, and give an up-to-date view of how the language is changing. Synchronically, the 'corpus *sans frontières*' is evident in the incalculably large and varied textual resources of the **World Wide Web**, problematic because of their indeterminate size, their varying quality, and their constantly changing nature. Much debate in recent corpus linguistics has been over 'the Web as corpus', and whether the internet makes the 'traditional' corpus of fixed size obsolete (see Hundt et al. 2007).

Availability limitations

In three respects, however, the above account paints too optimistic a picture of corpus availability. First, the technical problems of data capture – e.g., inaccuracies of OCRs – cannot be ignored.

Second, **automatic data capture** is limited to written text and is likely to remain so for a considerable time. Spoken texts must first be transcribed into written form, which means a continuing deficit of spoken (in comparison with written) corpus data.

Third, **electronic texts** are subject to copyright and other proprietary restrictions, which impose strong constraints on their availability for research. Some corpora can be made available for purposes of academic research only (i.e. not for commercial or industrial exploitation). Other corpora or text collections are subject to stronger restrictions, and of the many corpora that have been automatically compiled, most are available (if at all) only through licensing agreements or negotiation with their compilers and/or copyright holders. Restrictions of privacy, data protection and copyright also apply to spoken corpora. These limitations affect both the creation of corpora and their use.

Using corpora: first steps

To put ourselves in the position of a linguist using a computer corpus, let us initially imagine someone wishing to investigate the use of the English word *big* (say, as part of a comparison of *big* and *large*). The task of the computer in this case is most readily seen as that of producing a list (perhaps a sample list) of occurrences of *big* in a given corpus, together with enough context to enable the researcher to interpret examples in terms of their lexical, syntactic, semantic or pragmatic determinants. This is part of what is provided by search software such as **WordSmith Tools** (Scott 2004). A **KWIC concordance** (KWIC = key word in context) is a particularly convenient form of data display, where each token of the target word (*big*) is placed in the middle of a line

of text, with the remainder of the line showing its preceding and following context.

Typically, a set of characters at the beginning or end of the line specifies the **location** of the given occurrence in the corpus. Elements of the **mark-up**, i.e. the encoding of features of the orthographic format of the corpus, can be displayed to the user, or else hidden from view. The concordance is also normally accompanied by other functions, such as the sorting of examples by leftward or rightward context, the listing of collocations of the target word in terms of collocational strength, and the frequency-listing of words in the corpus.

Linguistically annotated corpora

Such a concordance is one of the simplest yet most powerful devices for retrieving linguistic data from a corpus. But it is word-based, and also illustrates a limitation of any corpus stored in the normal orthographic form. If the word to be investigated had been (for example) *little*, the concordance would have listed all the occurrences of *little*, whether as an adjective, a pronoun, a determiner or an adverb. A further difficulty would arise if the investigator wanted to examine all instances of a verb such as *find* or *leave:* here several different target forms would be needed (*leaves*, *left*, *leaving*, etc.) for the same verb. This illustrates a general problem: that information not stored in orthographic form in the 'raw' corpus cannot be retrieved in a simple or useful way. An answer to this problem is to build in further information, by producing linguistically analysed or annotated versions of the corpus. A first stage in the **annotation** of a corpus is typically **POS-tagging** (part-of-speech tagging), that is, the labelling of each word token in the corpus with a word-class **tag** (Van Halteren 1999). The result is a POS-tagged corpus.

Many corpora (e.g., Brown, LOB, FLOB and Frown, and the BNC) are distributed in POS-tagged versions. Although manual tagging is possible in principle, in practice the tagging of any sizeable corpus is feasible only if done automatically, by a computer program or suite of programs known as a **tagger**. This ensures not only speed but relative consistency of tagging practice. The tagging of the BNC (using a set of around sixty POS-tags) was undertaken by a tagger that achieved 96–7 per cent success (see Garside et al. 1997: chapters 2 and 9), increasing to 98 per cent in the latest version. Where a tagger makes mistakes, these should preferably be corrected by hand – a mammoth task so far undertaken only for a 2-million-word sub-corpus of the BNC.

POS-tagging is often seen as a preliminary to a larger enterprise, for example the compilation of a dictionary, or the **syntactic analysis** (or **parsing**) of a corpus. A syntactically annotated corpus (often known as a **treebank**) results from much more complex processing than POS-tagging, needing a greater role for manual analysis and correction. Two important treebank projects are the **Penn Treebank project** initiated by Marcus (ftp//ftp.cis.upenn.edu/pub/treebank/doc/manual) and the British incarnation of ICE, known as **ICE-GB**. The latter is available on CD-ROM together with the sophisticated software package **ICECUP**, enabling searches to be made on syntactic patterns (Nelson et al. 2002).

There is no reason why the annotation of a corpus should be restricted to grammatical analysis: semantic, pragmatic, discoursal and stylistic information may also be added in the form of annotation. Research is also well advanced, for example, in semantic word-tagging (http://ucrel.lancs.ac.uk/usas), in speech-act annotation (Grice et al. 2000) [*see* SPEECH-ACT THEORY], and in the tagging of stylistic features such as direct and reported speech (Semino and Short 2004).

Arguments for and against annotation

A corpus can be processed to produce derived datasets, or data resources, of various kinds. The simplest example is the production of word-frequency lists, a task now routinely performed by search tools such as WordSmith (see above). With a POS-tagged corpus, it is possible to automate the production of frequency lists which are **lemmatised**; that is, where different grammatical forms of the same word (or **lemma**) are listed under one entry, as in a standard dictionary (Leech et al. 2001 provide such lists for the BNC). As more annotation of corpora is undertaken, further types of derived datasets become available, e.g., corpus-derived lexicons, probabilistic grammars and collocation dictionaries.

On the other hand, there are differences of opinion about the value of annotation. Any set of categories used for annotation (e.g., the set of c. sixty tags used for POS-tagging the BNC) is likely to contain controversial features, and one influential opinion (Sinclair 2004; Tognini-Bonelli 2001) is that such categorisation of the data biases an investigation towards predetermined analyses, rather than allowing the analysis to emerge from the investigator's interaction with the 'pure' data of the text. Against this, probably a consensus exists in favour of annotation as 'value added' to a corpus, even though some aspects of annotation might prove more useful or more questionable than others.

Applications of corpus-based research

Apart from applications in linguistic research per se, the following practical applications may be mentioned.

Lexicography

Corpus-derived frequency lists and (more especially) concordances have established themselves as basic tools for the lexicographer. For example, KWIC concordances of the Birmingham Collection (a predecessor of the Bank of English) were systematically used in the compilation of the *Collins COBUILD English Language Dictionary* (COBUILD 1987; Sinclair 1987c). While this dictionary was something of a landmark publication, other English language dictionary publishers have since invested heavily in building and maintaining corpus resources. For example, the **BNC** has been exploited for the monolingual dictionaries of Oxford University Press, Longman and Chambers, the three publishers who contributed to its compilation. Corpus technology is also making an impact in bilingual dictionaries: the Longman *Eiwa Jiten* English–Japanese Dictionary (Pearson Longman 2006) is an example of a bilingual dictionary based on extensive corpora from both its target language and source language.

Language teaching

Applications to the educational sphere have recently developed more rapidly, as cheaper and more powerful hardware comes within the range of educational budgets. The use of concordances as language-learning tools has been a major interest of **computer-assisted language learning** (**CALL**; see Aston et al. 2004). The development of specialised corpora (see Kennedy 1998: 33–45) of, say, spoken academic English (such as **MICASE**) and technical and scientific Englishes have obvious applications to the learning of English at advanced levels, while the value of corpora for interlanguage research (e.g., corpora of learners' English) has been demonstrated through major initiatives such as the **International Corpus of Learner English** (**ICLE**; see Granger et al. 2002).

Translation

Another developing field of application is the use of corpora as aids to (the teaching of) translation, as tools for machine or machine-aided translation, or as sources for establishing the special nature of translated text. **Parallel corpora** of texts and their translations exist for a number of language pairs: for example, a 60-million-word corpus of English and French versions of the *Canadian Hansard* (proceedings of the Canadian Parliament) was used experimentally in the 1990s to develop a new kind of corpus-based automatic-translation technique. The compilation was of a corpus including texts from a number of languages translated into English, intended for comparison aimed at establishing whether there are features specific to translated texts. The interest in using corpora for translation training and research was sparked by Baker in the early 1990s (see Baker 1993, 1995, 1996) and has continued, with initially promising results (Lavoisa-Braithwaite 1996). For recent developments in cross-linguistic corpus-based research, making use of parallel corpora of four languages (English, French, German and Norwegian) see Johansson (2007) [*see* CONTRASTIVE ANALYSIS/CONTRASTIVE LINGUISTICS].

Speech processing and NLP

Machine translation is one example of the application of corpora to what computer scientists called **natural language processing**

(**NLP**), **language technology**, or **language engineering**. Another is **speech processing** (see Gibbon et al. 2000): that is, the development of computer systems capable of outputting automatically produced speech from written input (**speech synthesis**) or converting speech into written form (**speech recognition**).

Although **speech synthesisers** have been available for some years, their output remains an imperfect imitation of natural speech, and in order to simulate high-quality speech with appropriate features of connected speech (such as stress, vowel reduction and intonation), a key tool is a corpus of spoken texts, including a version with detailed prosodic transcription. Speech *recognition* is more difficult but, again, systems which perform recognition on a large vocabulary are already commercially available. Research is still, however, a long way from the ultimate goal – a computer system that will accurately recognise continuous speech from any speaker, using an unrestricted vocabulary.

The problem is that acoustic processing can accomplish with sufficient accuracy only part of the task of speech recognition: the ambiguities of the spoken signal mean that a speech recogniser must incorporate a **language model**, predicting the most likely sequence of words from a set of sequences of candidate words left undecided by acoustic analysis. Thus the speech recogniser must incorporate enough 'knowledge of the language' to enable the most likely sequence of candidate words to be chosen. This knowledge must include, at a basic collocational level, the knowledge that *a little extra effort* is more likely than *a tickle extra effort*, or that *deaf ears* is more likely than *deaf years*. At a more abstract level, a language may incorporate likelihoods of word-class sequences or syntactic patterns. To obtain accurate statistical estimates, very large quantities of textual data have to be analysed automatically. In effect, a corpus-based approach is essential.

The most challenging area of research in speech and language technology today is probably that of **spoken dialogue systems**, designed to enable interactive communication to take place between human and machine, or between human and human with a machine as intermediary. Not only speech processing but all levels of NLP may be simultaneously required, if the computer is to simulate the behaviour of a human interlocutor. Here, again, the corpus turns out to be an essential tool: we cannot build a machine to mimic human dialogue behaviour, unless dialogue behaviour has first been modelled in detail, through the analysis of corpora of real dialogue (see Gibbon et al. 2000).

The research paradigm for speech recognition, as mentioned above, is probabilistic, and this is likely to remain a feature of corpus-based NLP. Although any corpus, however large, is finite, a probabilistic system can use this as a basis for predicting the nature of previously unencountered data. The negative side of this is that the system is fallible: hence one focus of current research is the synergy of probabilistic and rule-driven techniques, which will hopefully bring greater accuracy to the robustness of statistical models.

Corpus linguistics and linguistic theory

It is a common presumption that corpus linguists are occupied with 'word crunching' activities which, at most, contribute descriptive facts to linguistic knowledge but have little bearing on linguistic theory. Many corpus linguists would strenuously deny this: they would say that the relevance of corpus linguistics to theory is not just a question of corpus findings occasionally being used to confirm or disconfirm theoretical predictions, but of a whole new way of looking at language modelling.

The analysis of corpus data often assigns importance to both qualitative and quantitative results – and it is the quantitative results, in terms of frequency, that most strongly depart from the generative theoretic paradigm which has been dominant in linguistics over the past fifty years. Increasingly corpus linguists have employed sophisticated statistical modelling: including stochastic models such as hidden Markov models (HMM); and multi-dimensional or multi-factorial approaches (Biber 1988; Gries 2003).

This integration of frequency phenomena into theoretical thinking relates to another theoretical key principle typical of corpus linguistics: the tenet that languages are not just phenomena of the mind but are importantly manifested in linguistic use – that in studying linguistic use in

texts and transcriptions of speech, we study language. In this corpus linguistics follows a similar path to **usage-based linguistics** (see Barlow and Kemmer 2000).

A third key principle which has gained wide currency in corpus linguistics is the **idiom principle** (Sinclair 1991: 110–15) that language tends to be produced and understood in terms of recurring semi-preconstructed phraseological units such as *set eyes on* or *nice and warm*, rather than in terms of independent choices made for each word. Hence the collocational relations between words, as richly revealed in large corpora, are considered to be basic to the way language is stored in memory and operates in real time. The idiom principle has fundamental implications for language learning and language processing, and supports the view that lexis and grammar are not independent levels of language organisation, but are closely intertwined.

Conclusion

Returning to the discussion in the first section, we observe in the methodology of recent corpus linguistics an ironic resemblance to the pre-Chomskyan corpus-based paradigm of post-Bloomfeldian American linguistics. Whereas Chomsky, emphasising competence at the expense of performance, rejected the significance of probabilities, recent corpus linguistics and corpus-based language engineering have been unashamedly probabilistic, using a sophistication of the Markov process model of language that was summarily dismissed by Chomsky in the early pages of *Syntactic Structures* (1957). But corpus linguistics is far from being a return to past: it is a research programme that is taking linguistics in new directions that could not have been foreseen in the early days of computing.

G. N. L.

Suggestions for further reading

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Creoles and pidgins

A **pidgin** is a language which has arisen by a process of mixing a simplified form of a language spoken by people who travelled and colonised extensively (such as English, French, Spanish, Portuguese and Dutch), with a simplified form of a language of the people with whom they interacted repeatedly. Such languages often develop near main shipping and trading routes (Trudgill 1974b: 166, 169–70):

> English-based pidgins were formerly found in North America, at both ends of the slave trade in Africa and the Caribbean, in New Zealand and in China. They are still found in Australia, West Africa, the Solomon Islands … and in New Guinea. … (Not all pidgin languages have arisen in this way, though. Kituba, which is derived from Kikongo, a Bantu language, is a pidgin widely used in western Zaire and adjoining areas. And Fanagolo, which is based on Zulu, is a pidgin spoken in South Africa and adjoining countries, particularly in the mines. There are several other indigenous pidgins in Africa and elsewhere.)

(See further Holm 1988: xvi–xix, for comprehensive maps of areas using pidgin and creole languages.) Pidgins also arose when Africans who did not share a language were working together on plantations and chose to communicate using what they could glean of the coloniser/slave-owner's language, to which they added elements of their own native languages.

For second and subsequent generation users, pidgins may become a mother tongue, a **creole** (Holm 1988: 6); 'a language which has a jargon or a pidgin in its ancestry; it is spoken natively by an entire speech community, often one whose ancestors were displaced geographically so that their ties with their original language and sociocultural identity were partly broken'. Examples of creoles include Sranan, an English-based creole spoken in coastal areas of Surinam (Trudgill 1974b: 170), and the English-based West Indian creoles used mainly by people of African origin in the Caribbean (Sutcliffe 1984: 219). Non-English-based creoles derived from other European languages include French-based creoles spoken in, among other places, Haiti, Trinidad, Grenada, French Guiana, Mauritius, the Seychelles and some parts of Louisiana. There are also creoles based on Portuguese and Spanish (Trudgill 1974b: 170). A pidgin may become creolised at any stage of its development (see below).

Some generally fairly limited, anecdotal accounts of creoles and pidgins were written by travellers, administrators and missionaries as long ago as the early sixteenth century. Although some early reports were written with the explicit aim of teaching Europeans something about the structure of a pidgin or creole so that they could use it to communicate with its speakers (Romaine 1988: 7), the serious study of creoles and pidgins began with Schuchardt's series of papers on creole studies, *Kreolische Studien*, published in the 1880s (Schuchardt 1882, 1883), and Schuchardt (1842–1927) is regarded by many as the founding father of pidgin and creole linguistics (Romaine 1988: 4).

However, creoles and pidgins tended to be regarded as merely inferior, corrupt versions of donor languages (Romaine 1988: 6), and the study of them did not gain generally perceived respectability until 1959, when the first international conference on creole language studies was held in Jamaica by a group of scholars who recognised themselves as **creolists** (Decamp 1971a), and the proceedings published (Le Page 1961). Growing interest in the relationship between American Black English and pidgin and creole English also helped establish the discipline as a proper academic concern, and the publication in 1966 of the first undergraduate textbook on pidgins and creoles (Hall 1966) greatly helped to secure its place (Holm 1988: 55). A second conference was held in Jamaica in 1968 (Hymes 1971b), and since then conferences on pidgin and creole linguistics have been held regularly.

In the development of a pidgin language, the **superstrate language** typically provides most of the vocabulary. The superstrate language will commonly be that of the socially, economically and/or politically dominant group, and will be considered the language that is being pidginised, so that a pidgin is often referred to as, for instance, Pidgin English or Pidgin French. The other language or languages involved are referred to as the **substrate language(s)**. The pidgin tends to retain many of the grammatical features of the substrate language(s). In spite of the fact that pidgins thus arise as two or more languages are mixed, so that speakers of any one of these languages may perceive the pidgin as a debased form of their own language (an attitude clearly expressed by the superstrate-language-speaking authors of many early studies), it is important to note that it is now generally agreed among scholars of pidgin languages that they have a structure of their own which is independent of both the substrate and superstrate languages involved in the original contact (Romaine 1988: 13).

Linguistic characteristics of pidgins and creoles

It is impossible to give a comprehensive overview of all the linguistic characteristics of creoles and pidgins here, but see Holm (1988) for a full account.

Phonology

In general, languages in contact build on those sounds they have in common. Therefore, phonemes that are common throughout the world's languages are more likely to occur in pidgin and creole languages than those phonemes that

occur in only very few of the world's languages. Thus /d/ or /m/, for instance, are more common in pidgins and creoles than /ð/ and /θ/. However, the actual pronunciation, or phonetic realisation, of the phonemes frequently varies according to speakers' first languages, and during the creolisation process (see below) pronunciation will tend towards the pronunciation used by the group whose children are using the language natively rather than towards the superstrate language pronunciation. In addition, if contact with the substrate language(s) is maintained and/or superstrate contact is lost early in the development of a creole, it tends to contain phonemes only found in the substrate language. In addition, the sound systems of pidgins and creoles are subject to the general patterns of phonological change which can be found throughout the world's languages (Holm 1988: 107).

Creoles often retain pronunciations which are no longer retained in the source language. For instance (Holm 1988: 75):

> Miskito Coast CE [Creole English] retains the /aɪ/ diphthong that was current in polite eighteenth-century British speech in words like *bail* 'boil' and *jain* 'join'; this sound became /ɔɪ/ in standard English after about 1800. This makes the creole word for 'lawyer' homophonous with standard English *liar* but there is no confusion since the latter takes the dialectal form *liard* analogous to *criard* 'crier' and *stinkard* 'stinker' – cf. standard *drunkard*.

Lexis

Since the early contact situations which produced pidgins revolved around trade, work and administration, since most of the items and concepts involved were European, and since the Europeans involved were more powerful socially, economically and politically, the vocabulary of early pidgins was mainly based on European languages and was limited to that required for trade, administration and giving orders. Consequently, pidgins have rather smaller vocabularies than natural languages, but this tends to be compensated for by **multifunctionality** (one word to many syntactic uses), **polysemy** (one word to many meanings) and **circumlocution** (phrase instead of single word) (Holm 1988: 73), so that the semantic system need not be impoverished, certainly not in the later stages of the development of the language (Hall 1972: 143):

> the vocabularies of pidgins and creoles manifest extensive shifts in meaning. Many of these changes are the result of the inevitable broadening of reference involved in pidginisation. If a given semantic field has to be covered by a few words rather than many, each word must of course signify a wider range of phenomena. Two pidgin examples out of many: CPE [Chinese Pidgin English] *spit* means 'eject matter from the mouth', by both spitting and vomiting; MPE [Melanesian Pidgin English/Tok Pisin] *gras* means anything that grows, blade-like, out of a surface', as in *gras bilong hed* 'hair', *gras bilong maus* 'moustache', *gras bilong fes* 'beard'.

As Romaine (1988: 36) points out, the restricted vocabularies of pidgins lead to a high degree of **transparency** in pidgin compounds; that is, the meaning of a compound can often be worked out on the basis of the meanings of the terms that make up the compound. However, **semantic broadening**, which takes place when a term takes on new meanings while still retaining its original meaning, can create confusion for the uninitiated. Thus, in most English creoles, *tea* has broadened in meaning to refer to any hot drink, so that '*coffee-tea* is used throughout the Anglophone Caribbean, including Guyana where Berbice CD [Creole Dutch] speakers use the term *kofitel*. … In Lesser Antillean CF [Creole French] "hot cocoa" is *dite kako* (cf. F *du thé* "some tea")' (Holm 1988: 101).

Any gaps in the vocabulary of a pidgin in the early stages of development will be filled in through borrowing or circumlocution. Later, however, at the stage which Mühlhäusler (1986) refers to as **stable** (see below), a pidgin will often have set formulae for describing new concepts. He cites the use in Hiri Motu, an Australian pidgin, of the formula O-V-*gauna* to express that something is a thing for doing something to an object, as in (Mühlhäusler 1986: 171):

Hiri Motu	Gloss	Translation
kuku ania gauna	'smoke eat thing'	pipe
lahi gabua gauna	'fire burn thing'	match
traka abiaisi gauna	'track raise thing'	jack
godo abia gauna	'voice take thing'	tape recorder

Syntax

A stable pidgin can also use grammatical categories to distinguish between meanings, as in the case of the Tok Pisin aspect marker of completion, *pinis* (Mühlhäusler 1986: 171). Pidgins and creoles tend to have little or no inflectional morphology (*see* MORPHOLOGY; though see Holm 1988: 95–6, for some examples of inflection in creoles), and are often characterised by shifts in morpheme boundaries, so that an English word with plural inflection, for instance *ants*, becomes a morpheme with either plural or singular meaning. In French-based creoles, the article often becomes agglutinated, as in Haitian Creole French, where *moon* is *lalin*, from French *la lune*, 'the moon' (Holm 1988: 97). The general lack in pidgins of bound morphemes greatly facilitates change of, or increase in, the syntactic functions of words (Holm 1988: 103):

> Category changes found in Miskito Coast Creole include nouns from adjectives ('He catch *crazy*' 'He became psychotic'), from adverbs ('*afterwards*' 'leftovers'), and from prepositions ('He come from *out*', i.e. 'from abroad'). Verbs can come from nouns ('He *advantage* her', i.e. 'took advantage of') as well as adjectives ('She *jealousing* him', i.e. 'making him jealous').

Romaine (1988: 27–8) notes that agreement markers are dropped in pidgins if they are redundant:

> For example, in the following English sentence, plurality is indicated in the noun and its modifier as well as in verb agreement in the third person singular present tense: *Six men come* (*cf One man comes*). The equivalent utterances in Tok Pisin show no variation in the verb form or the noun: *Sikspela man i kam/Wanpela man i kam*. Thus there is a tendency for each grammatical morpheme to be expressed only once in an utterance, and for that morpheme to be expressed by a single form.

Mühlhäusler (1986: 158–9) points out that the pronoun system of a pidgin is typically reduced, as in Chinese Pidgin English which has three pronouns, first, second and third person, but no number distinctions. Most pidgin pronoun systems are not marked for gender or case (Romaine 1988: 27).

Creoles contain a large number of syntactic features which are not found in the European languages that supply much of their vocabularies. Most of them rely on free rather than inflectional morphemes to convey grammatical information, so that typically the verb phrase, for instance, uses particles to indicate tense and aspect, and although these often have the form of auxiliary verbs from the lexical-source language, semantically and syntactically they resemble the substrate language's preverbal tense and aspect markers. If there are no such markers, the simple form of the verb refers to whichever time is specified earlier in the discourse, or by the general context (Holm 1988: 144–50). Studies of creole verb phrases in general have demonstrated the structural similarities of creoles and their structural independence of their superstrate languages, but (Holm 1988: 174):

> it was comparative studies of the creoles' various words for 'be' that unequivocally demonstrated that the creoles were not merely simplified forms of European languages. These studies showed that the creoles were in certain respects more complex than their lexical-source languages in that they made some grammatical and semantic distinctions not made in the European languages. … [They] often use quite different words for 'be' depending on whether the following element is a noun phrase, an adjective, or an indication of location.

In addition, a 'highlighter be' exists, the function of which is to bring the following words into focus rather like extra stress on a word in English or like introducing it with *it's* as in *It's Jane who lives here* (*not Elizabeth*) (Holm 1988: 179).

Serial verbs – that is, a series of two or more verbs which are not joined by a conjunction such as *and* or by a complementiser such as *to*, and which share a subject – are also a common feature of creoles. These often function as adverbs and prepositions in European languages, to indicate (1) directionality, as in Jamaican Creole English, *ron go lef im*, 'run go leave him', meaning 'run away from him'; or (2) instrumentality, as in Ndjuka, *a teke nefi koti a meti*, 'he took knife cut the meat', meaning 'he cut the meat with a knife'. In addition, serial 'give' can be used to mean 'to' or 'for', and serial 'say' can be used to mean 'that' when introducing a quotation or a that-sentence. Serial 'pass'/'surpass'/'exceed' can be used to indicate comparison. Similar construction types are found in many African languages (Holm 1988: 183–90).

The origin of pidgins

One of the most important theories to surface at the first conference on pidgin and creole linguistics in Jamaica in 1959 (see above) was the idea that all or most pidgins or creoles could be traced back to one common source, a Portuguese-based pidgin developed in the fifteenth century in Africa, which was later **relexified**, translated word for word, into the pidgins with other European bases which gave rise to modern creoles. This theory is known as the theory of **monogenesis** (one origin) or **relexification**, and it originates in its modern form in Whinnom's (1956) observation of the strong similarities in terms of vocabulary and structure between Philippine Creole Spanish and Ternate (Indonesian) Creole Portuguese. He hypothesised that a seventeenth-century pidgin version of the latter, itself possibly an imitation of the Mediterranean lingua franca, Sabir, had been transported to the Philippines.

Others noted that many of the features of Philippine Creole Spanish were also present in Caribbean creoles, in Chinese Pidgin English and in Tok Pisin, but that these had been relexifled (Taylor 1959, 1960; Thompson 1961; Stewart 1962a; Whinnom 1956; Voorhoeve 1973). Stewart (1962a) pointed out that, while speakers from opposite ends of the Caribbean were able to converse in their French-based creoles, neither would easily be able to converse with a French speaker. So, whereas the similarity of vocabulary could account for some mutual intelligibility, it was in fact syntactic similarity which was the more important factor, and this syntactic similarity pointed to a common origin for the French-based creoles.

In contrast to the monogenesis theory, Hall (1962) argued that pidgins would arise spontaneously wherever and whenever a need for a language of minimal communication arose, and that these could then be creolised. This view is known as the theory of **polygenesis** (multiple origin), and it found support in Decamp's (1971a: 24) argument that there are 'certain pidgins and creoles which clearly developed without any direct Portuguese influence'. In fact, few creolists would argue for a pure monogenesis theory, but most accept that a certain amount of relexification is an important element in the development of pidgins and creoles, particularly when closely related lexicons, such as Creole Spanish and Creole Portuguese, are involved (Holm 1988: 51–2).

The development of pidgins and creoles

A particularly interesting and provocative explanation for the development and characteristics of creoles has been offered by Bickerton (1974, 1977, 1979, 1981, 1984b), who argues (1984b: 173) 'in favor of a **language bioprogram hypothesis** (henceforth **LBH**) that suggests that the infrastructure of language is specified at least as narrowly as Chomsky has claimed'. The arguments for LBH are drawn from Bickerton's observations about the way in which a creole language develops from a pidgin which is in an early stage of development (1984b: 173):

> The LBH claims that the innovative aspects of creole grammar are inventions on the part of the first generation of children who have a pidgin as their linguistic input, rather than features transmitted from preexisting languages. The LBH claims, further, that such innovations show a degree of similarity, across wide variety in linguistic background, that is too great to be attributed to chance. Finally, the LBH claims that the most cogent

> explanation of this similarity is that it derives from the structure of a species-specific program for language, genetically coded and expressed, in ways still largely mysterious, in the structures and modes of operation of the human brain.

The data Bickerton uses to support his hypothesis shows early-stage pidgin to lack any consistent means of marking tense, aspect and modality, to have no consistent system of anaphora, no complex sentences, no systematic way of distinguishing case relations, and variable word order (1984b: 175). Children faced with this type of input impose ways of realising the missing features, but they do not borrow these realisations from the language which is dominant in their environment, nor from the substrate language(s), and Bickerton concludes that 'the LBH or some variant thereof seems inescapable … [and] the LBH carries profound implications for the study of language in general, and for the study of language acquisition and language origins in particular' (1984b: 184).

Bickerton claims (1984b: 178) that the evidence he cites shows the similarities in creoles to arise from 'a single substantive grammar consisting of a very restricted set of categories and processes, which … constitute part, or all, of the human species-specific capacity for syntax'. He leans towards the view that the single, substantive grammar does, in fact, constitute *all* of universal grammar, and he thinks that this view is supported by Slobin's (1977, 1982, 1984) notion of a **basic child grammar**, a grammar which is generated by a set of innate operating principles which children use to analyse linguistic input. But Bickerton (1984b: 185) claims that these operating procedures 'fall out from the bioprogram grammar': a child receiving only pidgin input will simply not have enough data for the operating principles alone to work on. In addition, Slobin's work shows that young children consistently violate the rules of their input language, and these violations are consistent with the rules Bickerton proposes for the bioprogram *and* with surface forms found in creoles (1984b: 185).

A number of commentators dispute the reliability of Bickerton's data. For example, Goodman (1984: 193) points out that Bickerton bases his argument entirely on data provided by a number of elderly Japanese, Korean and Filipino immigrants who arrived in Hawaii between 1907 and 1930. At this time, however, it is probable that a pidgin had already developed for use between English seamen and native Hawaiians (Clark 1979). This pidgin was historically linked both to other Pacific pidgin Englishes and to Chinese Pidgin English, with which it shared certain vocabulary and grammatical features. Consequently, it cannot be assumed that 'the pidgin as spoken by 20th-century immigrants from Japan, Korea and the Philippines is in any way characteristic of the incipient stage of Hawaiian Creole English' (Goodman 1984: 193). Goodman (1984: 194) argues that 'many widespread features of creole languages can be accounted for on the basis of similar structures in either the target or the substratal languages coupled with certain universal processes of selection in the context of language contact'. In his response to these arguments, however, Bickerton (1984a) questions the data which Goodman draws on in suggesting that a pidgin already existed in Hawaii when the subjects of Bickerton's study arrived there.

Maratsos (1984: 200) suggests that, judging from Bickerton's data, the input the creole speakers were presented with was too impoverished for them to have developed the creole. The creole, he notices, contains features of English vocabulary and syntax not found in the pidgin, so the creole speakers must have had access to linguistic sources other than the pidgin, and some relexification is likely to have been involved. Again, Bickerton (1984a: 215) counter-questions Maratsos' data.

Lightfoot (1984: 198) and Woolford (1984: 211) both point out that it is, in fact, extremely difficult to establish exactly what input creole speakers in the past may have had from their pidgin and from other sources, and what grammars they arrived at. Furthermore, comparable evidence from early stages of the formation of other pidgins and creoles would be required in order to evaluate Bickerton's claims for Hawaiian Creole English, but little evidence of this nature is available (Romaine 1988: 309). Nevertheless, because of the implications for linguistics of Bickerton's hypothesis (if it is correct), his

work has had a profound effect on the study of creoles (Holm 1988: 65).

As mentioned above, the creoles that concern Bickerton have arisen from pidgins which are at an early stage of development. The idea of developmental stages through which pidgins and creoles pass – a kind of lifecycle of pidgins and creoles – was present in Schuchardt's work, but found prominence in Hall (1962; Romaine 1988: 115). It has been developed by Todd (1974: 53–69), who distinguishes four phases of the **creolisation process**: marginal contact; period of nativisation; influence from the dominant language; and the post-creole continuum.

Mühlhäusler (1986: 22) points out that there are, in fact, two factors involved in the development of, and changes in, pidgins and creoles: development or expansion from jargon, through stabilised pidgin and expanded pidgin, to creole; and restructuring of either a stabilised pidgin or a creole, through post-pidgin or post-creole, to superimposed language. Restructuring occurs as a result of contact with other languages and does not affect the overall power of the linguistic system; therefore the varieties on this continuum are roughly equal in terms of linguistic complexity. On the developmental continuum, however, the varieties differ in terms of linguistic complexity and in terms of overall referential and non-referential power. He depicts the contrast as shown in Figure 1 (Mühlhäusler 1986: 11).

The notion of a continuum derives from traditional dialectology [*see* DIALECTOLOGY]. It is applied to the gradation of varieties between creole and standard English in the Caribbean by DeCamp (1961; Holm 1988: 55). These varieties are known as **mesolects**. The languages on the left of the mesolects in Figure 1 are called **basilects** and their related standard lexifier languages are called **acrolects**.

The early **jargon** phase is characterised by great variation in different speakers' versions of the jargon, a simple sound system, one- or two-word sentences and a very limited vocabulary (Romaine 1988: 117), with some simple grammar to allow for longer utterances added later (Mühlhäusler 1986: 52). The jargon is used only in restricted contexts, such as trade and recruitment of labour.

In a **stable-pidgin** stage, speakers have arrived at a shared system of rules governing linguistic correctness, so that individual variation is diminished. The process of stabilisation of a pidgin is generally characterised by **grammaticalisation**, whereby autonomous words become grammatical markers. According to Mühlhäusler (1986), the stabilisation stage in the pidgin or creole lifecycle is particularly important, because

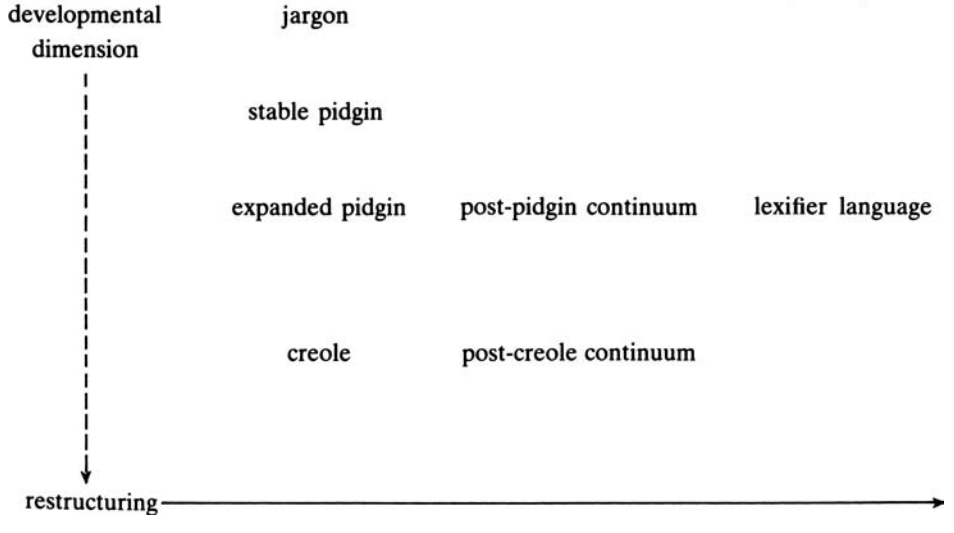

Figure 1 Factors involved in development and change in pidgins and creoles.

it is at this stage that the future shape of the language is determined.

An **expanded pidgin** has a complex grammar and a developing word-formation component, and the new constructions are added to the existing simpler grammar in an orderly fashion (Mühlhäusler 1986: 177). It is spoken faster than its precursor, and is used in almost all areas of life (Romaine 1988: 138). Expanded pidgins only arise in linguistically highly heterogeneous areas and typically accompany increased geographic mobility and inter-tribal contact due to colonial policies. Examples include West African Pidgin English, Tok Pisin (which also exists in creolised varieties), recent varieties of Hiri Motu, Bislama, Solomon Island Pidgin, Sango and some varieties of Torres Straits Broken (Mühlhäusler 1986: 177): 'The importance of expanded pidgins to linguistic research is twofold. First, they illustrate the capacity of adults to drastically restructure existing linguistic systems; secondly, they call into question such dichotomies as first and second, primary and secondary, native and non-native language.'

A creole may arise from a jargon, a stable pidgin or an expanded pidgin. Since these differ in the respects broadly outlined above, the degree of repair needed before they can function as adequate first languages for their speakers is also different. A **creolised jargon** will have undergone repair at all the linguistic levels, to bring about natural phonological, syntactic, semantic and pragmatic systems. In the case of a **creolised stable pidgin**, pragmatic rules will have been arrived at, and the systems already at play in the stable pidgin will have been developed. A creolised extended pidgin differs from its basilect mainly in its stylistic and pragmatic potential (Romaine 1988: 155).

According to Foley (1988), Tok Pisin has undergone two kinds of creolisation: urban and rural. An urban environment in Papua New Guinea is highly diverse linguistically, so that the only language an urban child will typically have in common with its peers tends to be Tok Pisin. In rural parts of Papua New Guinea, particularly in the Sepik region, Tok Pisin has been perceived as a high-prestige language offering access to the outside world since at least as long ago as the 1930s (Mead 1931), and parents are therefore very eager that their children, particularly boys, should use it. Foley (1988) suggests that this parental encouragement of the use of Tok Pisin, together with the fact that the native languages of many communities have very complex morphologies so that bilingual children find it easier to use Tok Pisin, has led to complete creolisation of Tok Pisin and the disappearance of a number of the vernaculars.

Once a creole is in existence, it may, according to Decamp (1971b):

- continue almost without change, as appears to be the case for Haitian Creole;
- become extinct;
- evolve further into a normal language;
- gradually merge with its acrolect through a process known as **decreolisation**.

During this process, a creole continuum of varieties between the creole and acrolect will emerge (Holm 1988: 52):

> A creole continuum can evolve in situations in which a creole coexists with its lexical source language and there is social motivation for creole speakers to acquire the standard, so that the speech of individuals takes on features of the latter – or avoids features of the former – to varying degrees. These varieties can be seen as forming a continuum from those farthest from the standard to those closest to it.

Mühlhäusler (1986: 237) defines a **post-pidgin** or **post-creole** variety as 'a pidgin or creole which, after a period of relative linguistic independence, has come under renewed vigorous influence from its original lexifier language, involving the restructuring and/or replacement of earlier lexicon and grammar in favour of patterns from the superimposed 'target' language.

African-American Vernacular English and British Jamaican Creole are often considered post-creole varieties (see, for example, Rickford 1998; Sutcliffe 1992).

K. M.

Suggestions for further reading

Holm, J.A. (1988) *Pidgins and Creoles*, Vol. I, *Theory and Structure*, Cambridge: Cambridge University Press.
Mühlhäusler, P. (1997) *Pidgin and Creole Linguistics*, 2nd edn, Oxford: Basil Blackwell.
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Critical discourse analysis

Introduction

Critical discourse analysis (CDA) investigates how language use may be reproducing the perspectives, values and ways of talking of the powerful, which may not be in the interests of the less powerful. It thus focuses on the relationship between language, power and ideology. There are many scholars working in CDA. Among its principal architects are Paul Chilton, Norman Fairclough, Teun van Dijk and Ruth Wodak.

Critical

Being 'critical' in CDA usually means studying and taking issue with power abuse, dominance and inequality:

> Analysis, description and theory formation play a role especially in as far as they allow better understanding and critique of social inequality, based on gender, ethnicity, class, origin, religion, language, sexual orientation and other criteria that define differences between people. Their ultimate goal is not only scientific, but also social and political, namely *change*. In that case, social discourse analysis takes the form of a *critical* discourse analysis.
>
> (Van Dijk 1997: 22–3)

CDA is thus a form of social critique. It encourages reflection on social processes and their relationship with language use, since it is assumed in CDA that this relationship is 'dialectical' or bi-directional. In other words, reproduction of unequal language use (e.g., 'man and wife' as opposed to 'husband and wife') can help to reinforce unequal social processes and vice-versa. CDA thus differs from other types of discourse analysis since it is not just concerned with a focus on texts, spoken or written, as objects of investigation:

> A fully 'critical' account of discourse would thus require a theorisation and description of both the social processes and structures which give rise to the production of a text, and of the social structures and processes within which individuals or groups as social historical subjects, create meanings in their interaction with texts.
>
> (Wodak 2001: 2–3)

For this reason, the concepts of ideology, power and history are key. With its focus on how language can reproduce structures of social dominance, the notion of 'critical' in CDA has its roots in the twentieth century in the work of the social theorist and philosopher, Jürgen Habermas, and further back to Frankfurt school theorists such as Max Horkheimer.

CDA is a committed form of discourse analysis since analysts are involved in contesting the phenomena they study. Critical discourse analysts often make their social and political position explicit (usually left-liberal) in revealing and challenging dominance. One does not need to be a critical discourse analyst to be critical of language use. But a critical discourse analysis would differ from a 'lay' critique by having 'systematic approaches to inherent meanings', relying on 'scientific procedures' and necessarily requiring the 'self-reflection of the researchers themselves' (Fairclough and Wodak 1997: 279).

Discourse

The concept of discourse in CDA usually encompasses two notions (Fairclough 2003: 3–4). The first is **language in use**. In reading, discourse refers to the meanings we derive from the text in line with the knowledge we possess, the amount of effort we invest, our values, our gender, etc. Let us call this first concept, discourse 1. Similarly, the discourse 1 of a conversation refers to the meanings made from the text in interaction with those features of context which are deemed relevant, e.g., tone of voice,

facial movements, hand gestures. (If the conversation is recorded the text would be the transcription of the conversation.)

A second key meaning of discourse in CDA is one associated with the work of the French social theorist/philosopher, Michel Foucault. Foucault (1972) characterises discourses as ways of talking about the world which are intricately bound up with ways of seeing and understanding it. For Foucault, discourses define and delimit what is possible to say and not possible to say (and by extension – what to do or not to do) with respect to the area of concern of a particular institution, political programme, etc. For example, different religions have their own discourses which delimit explanation of natural behaviour. Roman Catholicism now accepts that the universe began with 'the big bang' (scientific discourse) but that God initiated it (religious discourse). Let me refer to this second meaning as discourse 2. Crucially for Foucault, and for CDA, there is a relationship between discourse 2 and those with power since they ultimately control discourse 2 and have the means to reproduce it (e.g., newspaper moguls). It is worth emphasising that while it is often analytically useful to make this distinction between discourse 1 and discourse 2, as Widdowson (2007: xv) asserts: 'The two ways of thinking of discourse are not mutually exclusive … It is more a matter of emphasis.' A third sense of 'discourse' current in linguistics is the sense 'language above the level of the clause or sentence'.

Analysis

The best known, and most used, analytical framework in CDA is Fairclough's (see, for example, Fairclough 2001). There are three fundamental stages in this framework: description, interpretation and explanation. **Description** involves detailing precisely what linguistic features are in a text, as well as its absences, using a variety of analytical tools (e.g., **systemic-functional grammar** [see SYSTEMIC-FUNCTIONAL GRAMMAR]). On the basis of the description, the next stage is to make an **interpretation** of how the text might lead to different discourses 1 for different readers in different **discourse practices** or the situation of language use, e.g., an interview, a chat in a bar, a school debate. Interpretation thus focuses on the relationship between text and interaction. Fairclough refers to this as 'processing analysis' (see Figure 1), indicating that it is the cognition of text, written or spoken, which is the focus of this stage. Critique in the interpretation stage means pointing to a **misrepresentation** or a **cognitive problem**. This could mean that some crucial information is missing from a particular text,

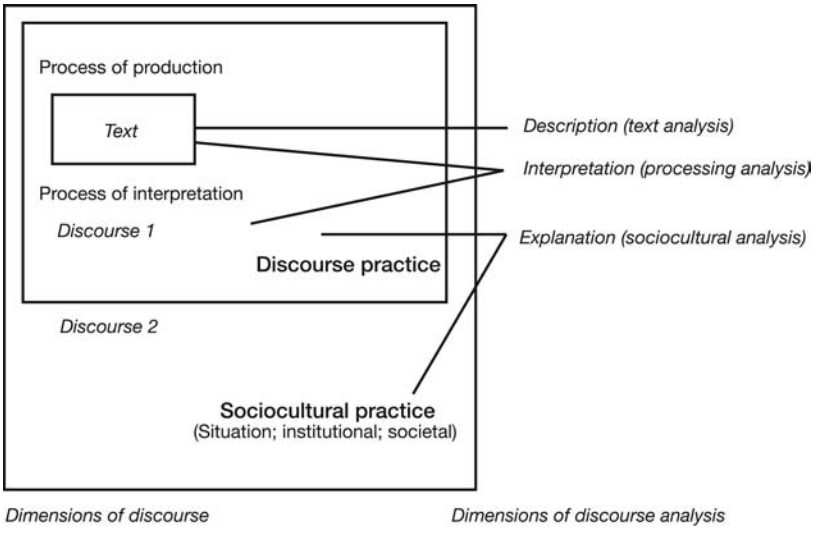

Figure 1 Source for original figure: Fairclough (1995a: 98). 'Discourse 1' and 'Discourse 2' have been added.

which leads to the reader being misled. This stage also seeks to show how wider social and cultural contexts and power relations within them (discourse 2) might shape the interpretation (discourse 1) of a text. In **explanation**, CDA critically explains connections between texts and discourse(s) 2 circulating in the sociocultural practice. Critique here involves showing how the 'ideological function of the misrepresentation or unmet need' helps 'in sustaining existing social arrangements' (Chouliaraki and Fairclough 1999: 33).

An example

Imagine a news editorial written about an ecoprotest which aims to prevent the building of another runway at an international airport; the editorial takes the line that the protest is 'antidemocratic' in causing delays for 'ordinary people' going abroad for a holiday, and people coming from abroad to do business. A CDA would begin by making a systematic linguistic **description** of the editorial's content: how the text (and any images) constructs a representation of social phenomena (real or imaginary), and how this representation positions the target reader. Descriptions of texts and images in good CD analysis practice are usually rich and comprehensive. The analysis may then go on to **interpretation** showing how discourse 2 can set limits on a reader's understanding of the editorial (i.e. their discourse 1). For instance, the editorial may be cuing in the reader's mind discourses 2 of democratic freedom, rights and entitlement, rather than social or environmental duties, which in turn may predispose the reader to agree with the editorial. **Explanation** of the editorial might be critical in examining how 'hidden' ideological structures and discourse 2 are in a dialectical relationship with the text. In this instance, this explanation might critique how the text implicitly promotes the advantage to a country's economy of an extra runway over the detrimental effects to the environment and, more broadly, how climate change or global warming is tied up to a significant extent with the globalisation of consumer capitalism. As Fairclough and Wodak (1997: 275) argue, discourse 2 can do ideological work because 'ideologies are particular ways of representing and constructing society which reproduce unequal relations of power, relations of domination and exploitation'.

Approaches

Although Foucauldian discourse theory is commonly drawn upon, CDA is not a unitary theoretical framework. Neither is it a political party, nor a sect (Weiss and Wodak 2003). It is multidisciplinary, encompassing a variety of approaches which may be combined in description, interpretation and explanation. Some salient approaches are discussed below.

The emphasis of **critical linguistics** is on how language is used to represent events and social actors. Through the use of linguistic tools of analysis, critical linguistics aims to reveal the hidden biases, or the 'angles of representation', in seemingly 'transparent' representation (Fowler et al. 1979; Fowler 1991, 1996; Kress 1989; Kress and Hodge 1979). One of its foci is mystification, analysing texts to reveal absences which can mystify, in reading, the nature of the events being reported. Trew (1979), regarded as a classic in CDA, highlights in a report from the British newspaper, *The Times*, how responsibility for police action in Rhodesia in 1975 is downplayed. To do so, Trew uses **systemic functional grammatical categories** (e.g., **Agent [Actor]**, **Affected [Goal]**, **Circumstance**, **Process**) [*see* SYSTEMIC-FUNCTIONAL GRAMMAR]. Here is an extract from *The Times* and Trew's analysis:

> Eleven Africans were shot dead and 15 wounded when Rhodesian police opened fire on a rioting crowd of about 2,000 …

Agent	Process	Affected	Circumstance
–	shoot dead	eleven Africans	(when) Rhodesian police opened fire on a rioting crowd

The functional analysis reveals:

1. that because of the use of the passive voice, 'Eleven Africans' (Affected) is 'thematised', i.e. it is the first semantic unit in the sentence;

2. an absence of explicit connection between an Agent and the Process 'shot dead' – agency has to be inferred from the Circumstance.

From such a functional analysis, Trew argues that in *The Times* 'the effects of the linguistic facts pointed out are a tendency to shift the focus away from those who did the shooting and onto the victims' (Trew 1979: 99).

Another concept that critical linguists are alert to is that of **nominalisation**, the representation of a process by a noun form rather than by a verb. Using nominalisation, information about agency, and thus responsibility for an action, can be deleted. For instance, the sentence 'the shooting of 11 Africans yesterday caused widespread outrage' contains the nominalisation 'shooting' and not the agent of the shooting. It should be clear from the above examples that critical linguistics describes texts so as to conduct critical discourse analysis, i.e. an interpretation that there will be important information missing from a reader's discourse 1. Synergy between systemic functional linguistics and CDA is still current (e.g., Coffin 2003; Coffin and O'Halloran 2006; White 2004; Young and Harrison 2004).

Fowler et al. (1979) and Kress and Hodge (1979), the culmination of work by authors at the University of East Anglia in the 1970s, is often cited as an antecedent of CDA. While the social theoretical base of CDA has become much more elaborate and diverse than the non-Foucauldian critical linguistics of the 1970s, the perspective in critical linguistics on mystifying language downplaying responsibility for social action is still a perennial one in CDA. However, there are problems with aspects of critical linguistics. It makes a series of implicit assumptions about the relationship between mystification and cognition which are bound up with cognitive paradigms of the 1970s. These assumptions are problematised by contemporary cognitive paradigms. O'Halloran (2003) underwrites mystification analysis in CDA by grounding it in a synthesis of such contemporary paradigms.

Socio-cognitive analysis focuses on the dialectical relationships between social structure, discourse 2 and discourse 1. The degree to which cognitive theory is drawn upon in socio-cognitive analysis varies. Fairclough (2001), for instance, draws on a limited number of cognitive concepts, e.g., **member's resources** – the store of socio-politicised knowledge people bring to texts and from which they generate inferences in reading. Consider Fairclough's commentary (2001: 44–5) on the following newspaper text (the *Daily Mail*, 1 June 1982) at the time of the Falklands/Malvinas conflict:

> The wife of the new Commanding Officer of the 2nd Parachute Battalion spoke last night of her fears for her husband's safety.
>
> As she played in the sunshine with her four children, Jenny Keeble said she hoped her husband would not have to go into battle again.
>
> She said: 'I pray he and his men have done enough. But if they do go on I know that he is a man who will do his job to the best of his ability and I am certain he and the 2nd Parachute Battalion will succeed … '

For Fairclough, if a reader does not resist how this text positions them to make inferences from sexist discourse 2, this will result in a sexist reading (discourse 1) which in turn reproduces discourse 2 and social structure:

> Notice that at no point … is Jenny Keeble explicitly *said* to be 'a good wife', or an admirable person; the process depends entirely on an 'ideal reader's' capacity to *infer* that from the list of attributes – she expresses confidence in her husband's professional abilities, she is concerned for his safety, she 'prays' he has 'done enough' … Texts such as this thus reproduce sexists, provided that readers generally fall into the subject position of the ideal reader, rather than opposing it.
>
> (Fairclough 2001: 44–5)

Van Dijk places much more emphasis on cognitive theory in socio-cognitive analysis than Fairclough and Wodak. Indeed, he is explicit that discussion of the relationship between discourse and social structure cannot fruitfully take place without consideration of how these phenomena are linked to the cognition of individuals (e.g., Van Dijk 1998). As such, Van Dijk has developed a theoretical base for socio-cognitive analysis (e.g., Van Dijk 2001).

The discourse-historical approach is associated with Ruth Wodak. It focuses on the contextualising and historicising of texts. To facilitate critical analysis, the discourse-historical approach integrates systematically all available background information in the analysis and interpretation of a written or spoken text. Wodak has developed a complex model of context which takes the form of concentric circles:

> The smallest circle is the discourse unit itself and the micro-analysis of the text. The next circle consists of the speakers and audience, of the interactants with their various personality features, biographies and social roles. The next context level involves the 'objective setting', the location in times and space, the description of the situation. Then, the next circle signifies the institution in which the event takes place. And we could naturally expand to the society in which the institution is integrated, its function in society and its history … The interaction of all these context levels would then lead to an analysis of discourse as social practice.
>
> (Wodak 1996: 21)

Much of the discourse-historical approach was developed in an interdisciplinary study of post-war anti-Semitism in Austria (Wodak et al. 1999). Anti-Semitism and racist prejudice generally are often implicit which make them less straightforward for the writer/speaker to be accused of bigotry. Through its movement between different levels of context, the discourse-historical approach is designed to reveal such implicit prejudiced discourse 1, as well as to identify and expose the codes and allusions which reproduce prejudiced discourse 2. More generally it seeks to understand, for example, how discourse 2 can serve to construct and perpetuate ideas such as 'race', 'nation' and 'ethnicity' (Wodak and Reisgl 2001: 385). This approach is explicit about minimising the risk of 'bias' in investigation and thus employs 'triangulation' or mixed-method research, drawing on a variety of different empirical data.

Fairclough's socio-cultural change approach focuses on the relationship between socio-cultural change and change in discourse, and especially changes in contemporary capitalism described as 'globalisation', 'post-' or 'late modernity', 'information society', 'knowledge economy', 'new capitalism', 'consumer culture' (Held et al. 1999). Fairclough notes how the boundaries between public and private discourse have shifted in the late twentieth and early twenty-first centuries, and this is revealed in processes where subjects are positioned in a more informal, chatty manner (e.g., in advertising). This shift in discourse 2 he refers to as **conversationalisation**. Fairclough also notes how conversationalisation has gone hand in hand with the increasing marketisation of society. By **marketisation**, Fairclough means how the ideology of consumer capitalism has encroached on public institutions such as higher education (e.g., Fairclough 1995b).

Much of Fairclough's work is an attempt to understand the language and practice of 'late modernity'. He argues that this is characterised by textual hybridity – the mixing together of different genres, styles and discourses: 'Late modernity entails a radical unsettling of the boundaries of social life – between economy and culture, between global and local, and so forth – one aspect of which is an unsettling of the boundaries between different domains of social use of language' (Chouliaraki and Fairclough 1999: 83).

To chart such textual hybridity as a reflection of this social change, Fairclough more explicitly draws upon **systemic-functional grammar** [*see* SYSTEMIC-FUNCTIONAL GRAMMAR] than Wodak or Van Dijk (see, for example, Fairclough 2003). A hallmark of his work is his explicit interest in bridging between social theory, which tends not to analyse texts, and work in text/discourse analysis, which has not traditionally sought to engage with social theoretical issues. Fairclough's engagement with the critical realism of the social theorist, Roy Bhaskar, is one such example (e.g., Fairclough et al. 2002).

Other work within CDA takes account of the relationship between text and image (**multimodal studies**), e.g., Lassen et al. (2006), Kress and Van Leeuwen (2006) (which also draws upon systemic-functional grammar [see SYSTEMIC-FUNCTIONAL GRAMMAR]). Aside from Van Dijk, there are other scholars working in CDA who draw on or adapt cognitive theory, particularly the conceptual metaphor theory associated with the work

of George Lakoff (e.g., Lakoff and Johnson 1980; Lakoff 1987); see, for example, Chilton (1985), Charteris-Black (2004), Goatly (2007), Koller (2004), Wodak (2006). Hart and Lukeš (2007) is an anthology that draws together different uses of cognitive theory in CDA. Evolutionary psychology is also drawn upon in more recent CDA (Chilton 2004, 2005; Goatly 2007; Hart 2005; O'Halloran 2005). Chilton (2004) is a key work in CDA which draws on both cognitive theory and evolutionary theory. Influenced largely by the pioneering work of Michael Stubbs, there is a host of new scholarship which uses methods of analysis from corpus linguistics (see next section). Finally, a counterpoint perspective to CDA is 'positive discourse analysis' (e.g., Martin 2004). The focus here is on understanding and promoting discourse which inspires and uplifts (e.g., writing by Mandela and Tutu) as well as discourse which is effective in mediation and diplomacy and promoting reconciliation, peace and happiness. Toolan (1997) calls for a different kind of positive discourse analysis when he argues that it is not enough in CDA to criticise the representation of a text; CDA should also be explicit about showing what non-manipulative texts would look like.

Commitment and analytical subjectivity

CDA has not escaped criticism (e.g., Blommaert 2005; Hammersley 1997; Stubbs 1997; Toolan 1997; Widdowson 2004). A common charge is of subjectivity of analysis which stems from political commitment. This can be problematic when critical discourse analysts are not part of the target audience of the texts they analyse. This is because the critical discourse analyst may describe aspects of the text which they object to, and go on to produce an interpretation of, when the target audience may not actually generate this interpretation. When there is no kind of empirically based investigation which can shine light on audience response or the facets of a text that the audience is likely to notice, CDA has been open to the charges of: (1) arbitrariness of analysis; (2) circularity from analysis to interpretation and back to analysis since there is nothing to determine which facets of a text to focus on other than what chimes with the political commitment of the analyst.

This is not to say that there is no empirically oriented work in CDA. For example, Murata (2007) uses reader-response data in her CDA; Bartlett (2004) combines ethnographic data with systemic-functional grammar. Moreover, it should be stressed that Wodak's discourse-historical approach has involved ethnographic investigation of how subjects engage with texts and that her triangulatory mixed-method approach helps to reduce analyst subjectivity in textual interpretation. The recent use of large reference corpora [*see* CORPUS LINGUISTICS] in CDA for purposes of comparison with the text(s) under investigation helps to reduce arbitrariness, and thus analyst subjectivity, in the choice of salient textual features (for examples of corpus-based CDA, see Adolphs 2006; Baker et al. 2008; Charteris-Black 2004; Gabrielatos and Baker 2008; Mautner 2007; O'Halloran 2007; Orpin 2005; Piper 2000; Stubbs 1996, 2001). Ultimately the most successful CDA employs a mixed-method (and thus triangulatory) combination of quantitative and qualitative analysis which involves empirical investigation of how subjects engage with texts.

K. O'H.

Suggestions for further reading

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D

Dialectology

Introduction

Dialectology is the study of variation in the lexical and structural components of language. It is usually associated with the study of geographical variation, especially in rural areas, but there is much dialectological work today which focuses principally on social variation and in urban areas (very often to the exclusion of more holistic spatial considerations; see Britain 2002, 2009b, 2010, in press a). Furthermore, it is usually associated with the consideration of non-standard varieties of language, though again, this is not an essential characteristic, with more and more work considering variation and change in standard varieties (see, for example, Harrington et al. 2000, 2006; Fabricius 2002, for English). And it is often associated with more traditional approaches to studying language variation, such as the study of, especially, lexical variation, among **NORMs** (Chambers and Trudgill 1998) – non-mobile old rural men – using single word elicitation techniques via questionnaires, but, with the ever-greater diversification of sociolinguistics as a discipline, especially in directions away from areas concerned with core linguistic structure, 'dialectology' is undergoing somewhat of a revival as a term to denote broadly variationist approaches to the study of language with or without an overt focus on social issues. This article provides an overview of the history and motivations of dialectology; an overview of the evolving methodologies associated with the discipline; a consideration of some of the main spatial dimensions in the subject; and a look at the main research agendas that are occupying dialectologists today.

The history of dialectology

Chambers and Trudgill (1998: 13–15) argue that until the mid- to late nineteenth century there was very little evidence of a coherent and systematic endeavour to formally study dialects. Before this time, there had been literary references to dialect differences, and, of course, much work by pronunciation specialists, dictionary-makers, grammarians and the like largely compelling us *not* to use non-standard forms, but it was not until scholars began to react to the work of the nineteenth-century Neogrammarians that serious and focused dialectological research began. The Neogrammarians had argued in favour of the exceptionlessness of sound change, a view that sparked interest in dialectology because of the wealth of evidence that dialect diversity could evidently bring to bear on this important question. Early work was largely in the form of dialect atlases – Wenker's 1881 *Sprachatlas des Deutschen Reiches* was the first published, and was shortly after followed by Gilliéron's *Atlas linguistique de la France*, begun in 1896, with the final volume of the atlas published in 1910. The most important early British contribution to dialectology was Alexander Ellis's (1889) volume V of *On Early English Pronunciation*, a large survey of over 1,100 locations in Great Britain, from which Ellis devised early maps of Britain's dialect regions. Subsequently, **dialect atlases** were produced for most countries in Europe, the USA, and beyond. The focus, at this time, was predominantly on rural areas (which were considered both to be the home of varieties that were more traditional than those found in urban areas, as well as to be more

sheltered from the influences of social mobility and consequent dialect contact), on men (again, viewed as likely to produce more traditional conservative dialects) and on the old. Dialectology had a very clear historicist agenda at this time, investigating the very many different diachronic developments of earlier structural forms across the dialect landscapes of the countries surveyed. While occasional nods were made in the direction of social diversity, in general, the early dialectological literature concerned itself rarely with intra-speaker or intra-community variability (see, for example, Jones's comments (2006: 274–80) on Ellis's sensitivity to methodological issues).

The 1960s saw the beginning of sociolinguistic inquiry into dialect, and with it a whole new set of theoretical orientations and a whole new set of methods. First, it brought dialectology very firmly to the *city* (to the extent that the term '**urban dialectology**' came to embody an approach and a methodology that could be applied anywhere, not just in cities), and, because of the focus of investigating language change in progress (Labov 1966), took into consideration adult speakers, native to the city under investigation, of all ages, genders and ethnic and social backgrounds. Second, it introduced a whole new theoretical apparatus for considering **change in progress** – the linguistic variable, facilitating an analysis of the proportions of use of different variants; the apparent time model, enabling a simulation of diachrony across the lifespan; the speech community, focusing on the socio-geographical scope and evaluation of structural variants, and so on. And finally it came with a whole new set of methods for data collection, to be discussed in the next section. Sociolinguistic dialectology has largely but not entirely replaced 'traditional' forms of dialectology. Resources from the work of the latter are still used in a number of contexts – in shedding light on earlier non-standard variation, for example, during the eras of colonial settlement (such as the application of the work of Ellis in accounting for the nineteenth-century development of New Zealand English in Britain [2005a, 2008; Gordon et al. 2004; Trudgill 2004]), or as an earlier real-time check on present-day developments, or as a way of highlighting the locus of incipient variants that were later to become important and widespread dialect forms.

Sociolinguistic dialectology has itself, of course, developed since its early days – it began by correlating linguistic structure with relatively under-scrutinised and etic social categories, such as social class, biological sex, biological age, 'style' as attention-paid-to-speech, and over time these social categories have been unpicked, contextualised and imbued with the local social meanings essential to rich sociolinguistic explanation of dialectological patterns. Over time, more emphasis in theoretical work has been placed on interaction and practice in local contexts, rather than on the analysis of disconnected individuals who happen to share some social trait. Furthermore, speakers who had been largely excluded from early sociolinguistic work – children, mobile people, non-natives – have now been incorporated into the sociolinguistic dialectological enterprise (see, for example, Chambers 1992; Foulkes et al. 1999; Fox 2007; Horvath 1985; Roberts 2002; Trudgill 1986).

Methodologies in dialectology

Early data collection in dialectology seems, from today's perspective, to have been a rather rudimentary enterprise, with a host of methods being used that would be judged unreliable today. We have to bear in mind, though, that dialectology began before the invention of recording equipment or the motor car – the most problematic aspects of traditional dialectological method are those concerning how examples of dialect speech were captured (before the widespread availability of affordable, unobtrusive and good-quality recording equipment) and how the dialectologist interacted with and accessed the dialect speakers themselves (given that it was extremely difficult to get to the small rural locations where NORMs live without a car). Neither data capture nor access, in the late nineteenth century, were the straightforward hurdles to clear that they are today. Wenker, for example, sent lists of sentences written in Standard German to schoolteachers around Germany asking them to transcribe them into the local dialect. Ellis, similarly, sent short reading passages to local enthusiasts, again asking them to transcribe the passages into the local dialect. (He did, however, have the help of Thomas Hallam, who had some background in phonetics, as a fieldworker to go

around the country checking out some of the dialect reports sent back by the enthusiasts.) Gilliéron, meanwhile, had Edmond Edmont, a fieldworker who literally cycled around France administering a long questionnaire in hundreds of different localities to collect data for the *Atlas Linguistique*. Given the firmly held sociolinguistic tenet that speakers' intuitions about their non-standard language use are often seriously unreliable (see Labov 1996 for an interesting and useful account of the intuition problem in dialectology), such transcriptions from the pens of untrained enthusiasts would not be entertained in the scholarly literature today. Questionnaires tended to be the data collection tool of choice. The ***Survey of English Dialects*** **(SED)**, for example, administered to each informant in over 300 locations a long and wide-ranging questionnaire containing over 1,000 items such as (1) and (2) below:

1. When you take a calf away from its mother's milk, what do you say you do? [expected response: spane/spone, wean] (Orton 1962: 57);
2. Sometimes, when children are behaving very badly, their mother will tell them that someone will come and take them away. What do you call this mysterious person? [expected response: bogey] (Orton 1962: 93).

Sometimes pictures or writing were shown to elicit words, or fill-in-the-gap techniques applied, most items relating to agriculture, the home and rural ways of life. The answers were transcribed on the spot by the fieldworkers using IPA. Some snippets of casual conversation were recorded, but since good-quality recording equipment was in its very infancy at the time of the data collection, Orton admits that there were quality issues with these recordings (Orton 1962: 19).

The advent of sociolinguistic **variationist approaches to dialectology** triggered significant changes in how dialectological data were collected. Early sociolinguistic work such as that of Labov in Martha's Vineyard (1963) and New York (1966, see also 2006) argued very strongly that social dialectology owed much to the earlier detailed work of the dialect geographers, but that in many methodological respects it had to part company:

- Traditional dialectology's fairly rigid questionnaires, with an output from informants of isolated words or short phrases in response to fieldworker questions, contrast markedly with the importance placed in social dialectology on the analysis of informal rapid and continuous vernacular speech. Despite this basic principle, however, some variationist dialectologists have continued to collect data from a range of other recorded tasks for specific purposes (e.g., the recorded reading of word lists and story passages to allegedly elicit more formal styles of speech or to elicit carefully controlled phonological contexts for acoustic phonetic analysis).
- Because recording equipment was either non-existent or tended to be bulky, expensive and, especially to the types of informant whose voice was sought, off-putting, traditional dialectological surveys tended to rely on the ability of fieldworkers to remember and instantly transcribe into IPA (or some other version of phonetic script) the realisations of words produced by the informants, and without the back-up of recordings to check the reliability of those transcriptions later. Furthermore, they tended to rely on one sole instance of a particular structural form from each informant as evidence of the realisation used in that locality; social dialectology has always been reliant on the analysis of often hundreds of tokens of the same variable from each informant (often using the multivariate analysis software **Varbrul** that was tailor-made for social dialectology) from recordings of continuous speech which can be checked many times and subjected both to reliability tests across a number of analysts and to acoustic analysis. Trudgill (1983: 35–41), for example, points to a number of examples of fieldworker inaccuracies in the SED data from the Eastern English county of Norfolk, and Trudgill et al. (1998: 39) and Trudgill (2004: 47) argue that sometimes the transcriptions in the SED are not detailed enough to be particularly helpful for historical work.
- Traditional dialectology did not systematically analyse **intra-speaker variability**, whereas such variability has, from the very start of social dialectology to the

present, played a very important role in our theorisation of the mechanisms of language change and the meaning of variation in contemporary speech communities. Sociolinguistic dialectology has continued to engage in ongoing deconstructions of intra-speaker variation during its short life to date (Bell 1984; Coupland 2007; Labov 1966).

- Because the fieldwork for traditional dialectological surveys was so time-consuming, many surveys used a large number of fieldworkers and it was often difficult to ensure that each one was working to the same script. Britain (1991), for example, found evidence in the SED that different fieldworkers in eastern England had transcribed the continuum between [ʊ] and [ʌ] for vowels in the STRUT lexical class (Wells 1982) differently, triggering dialectologists using the data later to classify the variation in that part of the country inaccurately.
- Traditional dialectology tended to place more importance on geographical coverage than on depth within a particular locality – very often localities are represented by just one (old rural male) person who may or may not be representative of that section of his community in general. Orton (1962: 16, for example, reflecting upon the SED data collection, stated that 'In the initial stages of their task, the fieldworkers tended to use too many informants, sometimes even as many as five'). Although by no means fully representative, sociolinguistic dialectology has seen it as imperative, if we wish to understand more about the social locus of linguistic change, to draw more than a single informant from a broader cross-section of the population of a particular locality. In the early stages, sociolinguistic dialectology still only analysed data from natives to the community, whereas later work showed the importance of including non-natives who may well introduce new dialect forms to local native communities – so Horvath (1985), for example, showed that linguistic changes underway in Sydney, Australia, could not be understood adequately without incorporating migrants of Italian and Greek ethnicities into her analysis, and Fox (2007) has shown how features of the English of Bangladeshi adolescents in London are spreading to the indigenous White community.

Since the 1960s, however, sociolinguistic dialectological method has moved on, too, largely in the way it operationalises the social categories which are indexed to linguistic variability. Researchers have therefore made significant advances in the way categories such as gender, sexuality, age and ethnicity are theorised in social dialectology and incorporated into data collection and analysis strategies (see, for example, Campbell-Kibler et al. 2001; Eckert 1990, 1997; Fought 2006; Meyerhoff 1996). Similarly, there have been major, but actually complementary advances in the sociolinguistic manipulation of the concept of 'community', with **speech community** (Patrick 2002), **social network** (Milroy 2002) and **community of practice** (Meyerhoff 2002) models being applied depending on the nature of the particular enquiry – the latter two represent more recent approaches, with social networks emphasising the role that speakers' social embeddedness into local communities plays in the maintenance of traditional dialect forms, and community of practice approaches highlighting the linguistic customs that emerge when people come together to mutually engage in a particular task. These levels of contextual analysis have enabled social dialectology to engage in research at very different scales, from, for example, a consideration of the extent to which the world's Englishes share linguistic features (Szmrecsanyi and Kortmann 2009) right down to the linguistic practices of a small group of 'uncool' girls in a Californian high school (Bucholtz 1999).

Rural versus urban

Given that one of the main aims of social dialectology was to discover the orderly heterogeneity of the speech community, searching for (and finding) such order in cities – which seemed like some of the most socially turbulent, heterogeneous and diverse communities in the world – was always going to be a powerfully persuasive strategy for the new discipline. Consequently, the abandonment of traditional dialectological data collection methods went hand in hand with the abandonment of the investigation of rural

areas (with an important early exception). In the popular imagination, cities were sites of diversity, conflict, contact, complexity, variation, change. Rural areas, by contrast, are often portrayed as the insular, the isolated, the static, and in some parts of the West as (attractive) idylls of peace, tranquillity and safety. That this urban–rural dichotomy is rather problematic (see, further, Britain, 2009b) was actually amply demonstrated in the very earliest social dialectological work – in Labov's (1966, 2006) analyses of both urban New York City and rural Martha's Vineyard (Labov 1963/1972). Labov argued that the Lower East Side of New York City represented 'a much more complex society' (Labov 2006: 3) than Martha's Vineyard, although ultimately social diversity in the city was distilled down to the variables of age, class, ethnicity and gender – factors which are also some (but not all) of the salient dimensions of social diversity in Martha's Vineyard (Labov 1972: 4–6). There, in this largely rural community, if we set aside the White Vineyarders, residents of Portuguese, Native American and other miscellaneous ethnicities make up half if not more of the population (Labov 1972: 6), even before we take into consideration a small resident population coming originally from the Mainland and large numbers of tourists. In addition these populations are not distributed geographically evenly across the island, and are, naturally, engaged in a diverse range of socio-economic activities. As the results of Labov's analysis demonstrated, the community showed considerable sociolinguistic diversity with respect to age, location, occupation, ethnicity, orientation towards the island as well as desire to stay on the island or leave (Labov 1972: 22, 25, 26, 30, 32, 39). In terms of social and linguistic structure, Martha's Vineyard hardly fits the rural stereotype of quiet and sleepy pastoralism, or of traditional dialectological NORMs, as Labov's analysis so succinctly showed. By contrasting a highly rural area with a highly urban one, his work can be seen as a clear demonstration that there are large-scale social(-linguistic) processes which are perhaps most obviously and vividly expressed in cities but are not confined politically, sociologically or epistemologically to an urban context (see, further, Britain 2009b).

Core versus periphery

There has long been a focus in dialectology on the location of dialect regions, examining both the core areas of those regions which share a large number of dialect features, as well as, in contrast, the peripheries of those regions where the influence of the centre is weakest, where changes emanating from that centre are slower to be adopted, and which show some affinities with dialect forms from other regions. Most core areas are situated around large urban centres which dominate their economic and cultural hinterlands, and both in the very earliest work and in the most recent, the location of regions and the examination of the dialects at their core has been central to dialectological work. Ellis, for example, at the very start of his survey of variation in anglophone Britain (1889: 3), detailed how the country was broken down into Divisions, Districts and Varieties, motivated by dialect phonology, and Wright (1905: 1) confronts this same issue as early as the second sentence of his *English Dialect Grammar*. More recently, Trudgill (1999: 83–4) has highlighted 'a predicted possible scenario for the division of the major regional varieties of English English for the next century'. In parallel with developments in human geography, however, the focus on regions went out of fashion during the quantitative era that coincided with the beginnings of variationist sociolinguistics, with the 1970s and 1980s consequently representing a relatively sparse period in the development of **geographically informed dialectology** (see, further, Britain 2002, 2009b, 2010, in press a). More recently, the region has returned with a vengeance in dialectology: there has been a recognition that as distinctive dialect diversity is being lost at the very local level in many Western countries, emerging, at the same time and as a result of mobility and intra-regional migration, are more supra-local, regional dialects within which a core of structural non-standard features are shared (e.g., Britain 2005b, 2009a; Hornsby 2009; Milroy et al. 1994; Vandekerckhove 2009; Watt 2002; Watt and Milroy 1999). Watt (2002), for example, found that the non-standard variants [e:] and [o:] of the variables (ei) and (ou) respectively, typical of Northern England, were taking over in Newcastle from the much more locally current

vernacular [ɪə] and [ʊə] variants (with standard forms used only by an insignificant minority of [mostly middle-class] speakers).

Between these apparently homogenising regional varieties are boundaries and transitions, well mapped through the enterprise of traditional dialectology and its **isoglosses** – geographically marking areas that are linguistically distinct but relatively rarely explored in variationist approaches to dialectology. Part of this lack of enquiry has been due to an underlying dissatisfaction with the **isogloss** (derived in the early days from analyses of single words based on single responses from a single speaker in a single location), which has, in more recent work, been replaced by the **transition zone**, demonstrating that, rather than sharp boundaries, the areas between regions are characterised by gradations of interdialectal diversity (see Chambers and Trudgill 1998; Britain 2001). It has also become apparent that a socially richer understanding of regions as arenas of economic and cultural practice can help us distinguish between different types of isogloss, such as between those that are simply reflections of the advance of ongoing geographical diffusion of linguistic innovations and those which truly are watersheds between different social, cultural, economic and geographical regions.

The contemporary dialectological research agenda

Dialectology is today a diverse field, and I conclude this article by briefly surveying some of the discipline's areas of contemporary research. In some senses, dialectology has begun to converge with and penetrate a number of sub-disciplines of theoretical linguistics, to the extent that dialectological practices have been absorbed into the agendas of those other fields. So, for example, there has been a meeting of minds with some theoretical syntacticians who have begun not only to incorporate evidence from non-standard dialects in their theoretical work but also take on board issues such as inherent variability and the need to be cautious about the scope of intuitions (see, for example, Adger and Smith 2005; Börjars and Chapman 1998; Bresnan et al. 2007; Cornips and Corrigan 2005a, 2005b, 2005c; Henry 2002, 2005; Rupp 2005; Wilson and Henry 1998). One especially notable example of this work is the development in the Netherlands of **SAND** (**Syntactische atlas van de Nederlandse dialecten**) (e.g., Cornips and Jongenburger 2001 for a methodological perspective) following the collaboration, both in terms of theoretical development and methodological application, of theoretical linguists and social dialectologists in the production of a modern atlas of Dutch language variation.

Similarly, phonetics and dialectology have together fused the new discipline of sociophonetics, applying advanced acoustic analysis to continuous, vernacular non-standard dialect data, and thereby uncovering patterns of fine grained socially indexical variation of which we were previously unaware (e.g., Docherty and Foulkes 1999; Docherty et al. 1996); theoretical phonologists have, likewise, engaged more readily with dialectological data, especially within the approaches of usage-based and exemplar phonology (e.g., Bybee 2006; Hay et al. 2006; Pierrehumbert 2001) and optimality theory (e.g., Uffmann 2007) – the interactions have extended also to linguistic typology (e.g., Szmrecsanyi and Kortmann 2009; Trudgill 2002).

Another recent development has been technology-driven. Advances in computerised cartography and the application of quantitative methodologies to dialectological data have led to exciting work in the computer modelling and processing of variable dialect data (e.g., Nerbonne and Heeringa 2007; Shackleton 2007) as well as the development of visually appealing and multidimensional dialect atlases and other forms of dialect map-making (see Lameli et al. in press, for a state-of-the-art review of language and dialect mapping). Technological advances have also meant that it has become easier and safer to store and make readily available large corpora of digitised spoken-dialect data which are not only proving to be a rich source of evidence for contemporary research on variation and change but will also provide (and are already doing so in a few studies) extremely useful real-time evidence for future generations of dialectologists (see, for example, Sankoff and Blondeau's work [2007] work on real-time change in Montreal French). Dialectology today can in many ways be seen as laying the foundations for a much richer historical linguistics of the future.

A recognition that dialectology was overly concentrated on static individuals in their local communities has led to a strong line of research examining the dialectological consequences of mobility and diaspora, considering such issues such as dialect levelling (see, for example, Britain 2009a; Kerswill 2003; Vandekerckhove 2002, 2009), dialect contact (Trudgill 1986), second dialect acquisition (Chambers 1992; Tagliamonte and Molfenter 2007), new dialect formation (Kerswill and Williams 2000; Trudgill 1986, 2004), as well as the inter-ethnic diffusion of the dialect forms of new migrant communities (Britain and Fox 2009; Fox 2007; Khan 2007; Torgersen et al. 2008). The research on new dialect formation in post-colonial contexts (e.g., in the anglophone Southern Hemisphere) has also, for example, triggered a resurgence of interest among contemporary scholars in the evidence found in traditional dialectological work since the latter represents the only information available on the relevant non-standard varieties spoken at or around the time of colonisation (and in doing so has dispelled some of the myths surrounding how these varieties have developed). Finally, interest in dialectology has come to the fore once again because of the recent deconstruction of 'space' and 'place' in the sociolinguistic literature (e.g., Britain 2002, 2010, in press a; Johnstone 2004, 2010, in press a). Drawing heavily from recent debates in human geography, dialectology is, in this line of research, going back to its roots in the more spatially oriented work of the nineteenth-century pioneers, but doing so in a more contextualised and socially richer way.

D. B.

Suggestions for further reading

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Discourse analysis

Three areas of definition

Dictionary definitions of 'discourse' historically describe the term's everyday meaning as 'an extended public treatment or discussion of a subject in speech or writing'. Nowadays, they will also include a second meaning which originates in the discipline of discourse analysis and which equates discourse with 'naturally occurring language use' and 'meaningful language use in context'. One way to throw light on the term 'discourse' is to stress how the appeal of the concept has been connected to the development of a specific agenda for language inquiry. Three areas of definition can broadly be identified.

1. Viewed from within a linguistic project, the analysis of discourse emerged with reference to specific language phenomena which are characteristic of running text and ongoing interaction, as well as locating an important area of meaning in what is functionally relative to situation, purpose and user. It is worth reminding readers here that some instances of early discourse research prioritised more the conversational domain of spoken exchanges, while other early developments focused more on the properties of written texts. Anglo-American work in particular interacted more directly with speech act theory and conversation analysis and was quick to integrate their key concepts and taxonomies. At the same time, early examples such as Labov and Fanschel (1977), Sinclair et al. (1972), Coulthard (1977) and Brown and Yule (1983) were still very much bracketed by more traditional linguistic concerns such as the detection of a hierarchical

structure in speech events in terms akin to that which had been described earlier for the grammatical constituents of the sentence. In early continental European developments which often identified themselves as '**text linguistics**' [see TEXT LINGUISTICS], the study of trans-sentential phenomena (e.g., aspects of cross-reference, the occurrence of argumentative and rhetorical structures, properties of language which lend a text cohesion, etc.) along with the study of the cognitive processing of textual units helped push the linguistic project beyond the confines of the isolated sentence. Early examples include De Beaugrande and Dressler (1981), Harweg (1968), Van Dijk and Kintsch (1983) and Werlich (1976).

2. From within a sociolinguistic project, the analysis of 'discourse' is connected with a qualitative research agenda on the role of language use in social life. Its context of emergence has been the formulation of an integrated sociolinguistic project in the 1960s and 1970s, especially the more qualitative '**interactional sociolinguistic**' traditions which developed out of the work of J. Gumperz and D. Hymes. Not surprisingly, central insights on the nature of interaction and situated language use drew substantially on theoretical conversations with speech-act theory, conversation analysis, ethnomethodology and Goffman's analysis of the interaction order (Gumperz and Hymes 1972b). While for some, speech-act theory's performative view on the linguistic utterance (cf. 'how to do things with words') counted as the primary point of departure for a generalised social actional view on language use (e.g., Fairclough 1989: 9), others also invoke ethnomethodology and conversation analysis as ground-breaking perspectives developed within sociology which connect interactional language use with the in-course production of a situational and social context (e.g., Duranti and Goodwin 1992: 22). Hymes' (1972b) formulation of the **SPEAKING-project** can be interpreted as the formulation of a discourse perspective within sociolinguistics. The speech event is its primary unit of analysis. Like many other linguistic anthropologists, Hymes does not use the term 'discourse' to define this project (except in its variant as a 'countable noun' to refer to particular ways of interacting and communicating which are associated with a particular domain, setting or topic).
3. Finally, as it also surfaced in a social theoretical context, 'discourse' has become a metaphor for understanding processes of socio-cultural representation. This area of definition signals how the concept of discourse has been implicated in some of the theoretical and epistemological challenges posed to the human and social sciences by post-structuralist theory. In Foucault's version of this (e.g., Foucualt 1972), discourse is connected to the production of truth and is centrally located in a field of productive power relationships which enable social life in its various forms and manifestations. It is particularly in this area that a discourse analytic perspective has spilled over into various disciplines (law, social work, history, etc.), where it has given rise to a 'linguistic turn' which stresses that truth is relative to what is articulated in discourse, while highlighting the social and institutional conditions that enable its expression. The discourse perspective is central to understanding certain aspects of the crisis of legitimacy in the human and social sciences. For discourse theorists such as Laclau and Mouffe (1985), Howarth (2000) and Torfing (1999), discourse has subsequently become an epistemology for reading a society's state of hegemonic relationships vis-à-vis particular ideological formations. Discourse theory is a form of political discourse analysis but it does not come with specific empirical imperatives which seek to do justice to the complexities characteristic of situated verbal material – textual and/or interactional. Finally, a constructivist perspective in which language use, often in combination with other practices, is seen as constitutive of social reality is intrinsic to many traditions of discourse analysis.

The contemporary scene

Discourse analysis has crystallised within language studies in two directions. One can note, on the one hand, a continuation of a more linguistic use

of the term in which discourse is viewed as the layer of meaning which is tied to situations of language use and located beyond the structural and semantic affordances of a language system. The focus here is often on large collections of verbal material of a particular situation or activity type and describing its specific lexical, grammatical, etc., properties, using quantitative methods. At the same time, recent decades have witnessed the formulation of a broad project of discourse studies which holistically views language use, often in combination with other forms of semiotic behaviour, from the angle of 'social practices' in context. Much discourse research thus simultaneously attends to textual, processual and social-actional dimensions of communicative behaviour, as well as its functioning at the level of ideological and socio-cultural reproduction and transformation. **Critical discourse analysis** (e.g., Fairclough 1992a; Wodak 1996) [*see* CRITICAL DISCOURSE ANALYSIS] has been a prime example of this second direction and must be accredited for seeking to link up the explanatory ambitions of social theory with societal critique and emancipatory goals for discourse research. Critical discourse analysis has been agenda-setting for a discussion of the connections between situated language use, power and ideology and has acted as a broker for much social theoretical work on 'discourse'. In fairness, one must note that this development has occurred alongside (and throughout the 1990s there has been growing interaction) with comparable programmes which originated in other traditions (e.g., Briggs 1996 in linguistic anthropology; Rampton 2006 in interactional sociolinguistics). Not surprisingly then, when the term 'discourse' is used in its countable form with a particular qualification which evokes the reality-creating capacities of forms of language use (e.g., 'capitalist discourses', 'sexist discourses', 'medical discourses', 'discourses of education', etc.), this sometimes counts as a reference to the identification of typical patterns of interaction and/or language use, and sometimes as a reference to a meaning universe associated with a particular social locus of language use. In many cases, however, the reference has been to both and the underlying assumption is indeed that the full range of phenomena that can be addressed under the heading of discourse is imbued with value. Specific fields of application have given rise to specialist off-shoots such as **forensic discourse analysis** (Coulthard and Johnson 2007) [*see* FORENSIC LINGUISTICS], **professional discourse studies** (e.g., Gunnarsson et al. 1997; Sarangi and Roberts 1999), **discourse stylistics** (e.g., Carter and Simpson 1989) and multimodal discourse analysis (e.g., Kress and Van Leeuwen 2001). Discourse perspectives have been articulated for specific language-related interests. For instance, Hatim and Mason (1990) have done this for **translation studies**, while Barton (2007), Street (2003) and Collins and Blot (2003) have articulated a **(critical) discourse perspective for literacy studies**. Discourse analysis can thus be summed up as entailing a particular perspective on language use and social life and the themes of identities-in-discourse and identities-as-outcomes-of-discourse are undeniably among the most commonly addressed in research across fields of application. Instances of discourse analysis will in many cases also draw seminally on various traditions in the study of language use or semiotics. For instance, whereas **discursive psychology** (Edwards and Potter 1992) has concentrated on themes from cognitive psychology such as everyday explanations, memory and attitude by bringing together a conversation analytic perspective with social psychological constructivism, **multimodal discourse analysis** (e.g., Kress and Van Leeuwen 2001; O'Halloran 2004) have drawn substantially on a systemic-functional perspective on meaning making for the development of a discourse analysis which is not restricted by an exclusive interest in verbal modes of communication.

Further issues

A number of theoretical and interpretative issues continue to stand out in recent work. With varying emphases, these foreground the problem of relevant contexts of interpretation. One such issue is that of **discourse practice** (a concept indebted to the work of Pierre Bourdieu): discourse can be observed as action and in situ behaviour but it also counts as pre-structured, it is habitual (and therefore internalised) but it is also attended to reflexively; it is invested with value, often implicit and naturalised, but nevertheless

also to be analysed as lived experience. The problem of understanding practice takes the question of relevant situated meaning beyond the confines of linguistic meaning, more fully into the domain of social interpretation. In this view, discourse practice is constituted in the interplay of linguistic, socio-cultural and ideological forces and it is subject to organisational principles which are partly trans-situational and partly local and specific to the interaction (cf. Gumperz 2003: 112–14).

A second key issue is that of 'structure' vs. 'agency'. This opposition is often articulated with reference to related pairs, such as the contrast between 'momentary' outcomes and 'longue durée' effects, or in slightly different terms, a contrast between the flexibility and room for negotiation of 'micro' behaviour vs. the steadfast directions of 'macro' stability and change. This particular field of interpretative tension derives in part from the presence of simultaneously articulated versions of the reality-creating capacities of discourse processes (cf. Philips 2001): one version reads that interactants have the power to shape emerging realities through the processes of discourse participation, especially in face-to-face interaction; this is typically contrasted with a second version which underlines the longer-term historical processes in which discourses are involved. The latter are often talked about in terms of socio-cultural reproduction and accumulative transformation over time. It is also worth noting that, except in the context of new literacy studies (e.g., Street 2003), an interactional perspective on the 'momentary' is still in quite a number of respects ill-developed with respect to written texts and texts with a one-to-many participation (e.g., mass media discourse). The challenge here is how to do justice to the in-course aspects of situated experiences of reading or interpretation, while answering questions about larger-scale impact. The risky assumption indeed has been that uniformity of textual artefact would warrant uniformity of interpretation (compare also with 'natural histories of discourse' [Silverstein and Urban 1996]).

Discourse types (whether viewed as form-meaning complexes or as social-actional modes) have also been attributed an agentive role in societal orderings of discourse practices. This has been a specific theme in the work of Fairclough (1989), who draws for this on Jürgen Habermas's discussion on the historically shifting relationships between the social life worlds and the systems as well as Foucault's postulate of the concept of an '**order of discourse**' (Foucault 1971). Discourse types and formats can be thought of in terms of ordered relationships of inclusion/exclusion, with regulated boundaries, processes of meshing and relationships of intrusion, and this is an important form of social ordering. This has resulted in process-oriented analyses of macro socio-economic contexts as giving rise to both hybridity in discourse and colonising tendencies (e.g., Fairclough 1992a identifies the commodification and conversationalisation of discourses in the domain of public institutions as two significant tendencies in contemporary neo-liberal Western democracies). Other related concepts, such as that of '**communities of practice**' (Eckert 1999) have stressed more the distribution of particular discourse practices over specific populations of users and regular participants in activities. Also under the rubric of the study of society-wide discourse formations is the interest in **discourse technologies**. This concept invites attention to the ways in which situation-specific forms of communication have become subject to explicit forms of teaching, training and monitoring and have in recent decades given rise to an unrivalled battery of communication manuals and training courses (promoting the ideal of the self-regulating individual). This line of research has also documented the salient role of particular discourse formats in the contemporary era, e.g., promotional talk, interviewing, counselling, etc. (Cameron 2000). From a linguistic anthropological angle, the challenges posed by the ordering of discourses in a social or cultural context have been addressed through the concept of **indexical orderings** (Silverstein 2003). With this, the allocation of instances and conventions of language use to a particular point and level of contextual ordering, whether micro, meso or macro, has been re-presented as a problem of interpretation-in-discourse. Two questions can be identified as running themes through the latter set of developments: there is the problem of space and time as contextual dimensions of discourse and, accompanying

these, a crisis in the identification of adequate units for analysis. As examples of the former, **geosemiotics** (Scollon and Scollon 2003) engages with the study of public signs to address some of the challenges posed by discourse in place, while Collins et al. (2009) and others have raised the relevance of spatial-temporal scales in the interpretation of multilingual repertoires. Wortham (2006) on the other hand foregrounds processes of mediation and emergence by raising the relevance of timescales within which to interpret in-course interactional processes in the construction of institutional identities. Central here are questions of sample and boundary. In both cases, it has been observed how contemporary processes of **globalisation** have undermined received stable interpretations of time and space, necessitating instead that they are treated as volatile assumptions, the construal of which is difficult to separate from the interactional processes themselves.

S. S.

Suggestions for further reading

Erickson, F. (2004) *Talk and Social Theory*, Cambridge: Polity Press.
Fairclough, N. (2001) *Language and Power*, 2nd edition, London: Longman.
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Distinctive features

Introduction

Distinctive features have their origin in the theory of phonological oppositions developed by the Prague School (see Trubetzkoy 1939). In this theory, words of a language are differentiated by oppositions between phonemes, and the phonemes themselves are kept apart by their **distinctive features** – phonetic properties such as 'voice', 'nasality', etc. These features are grouped phonetically into a variety of types, and the oppositions between the phonemes are also classified 'logically' in a number of different ways, according to the nature of the features concerned [*see* FUNCTIONAL PHONOLOGY; PHONEMICS].

The theory of distinctive features was elaborated and radically transformed by Roman Jakobson (1896–1982), especially in the 1940s. For classical Prague School theory, features were merely dimensions along which oppositions between phonemes may be classified; Jakobson made the features themselves, rather than indivisible phonemes, the basic units of phonology and further developed the theory of their nature and role, attempting to make it simpler, more rigorous and more general.

The acoustic character of features

Unlike the majority of phonological theories, which have taken articulatory parameters as the basis for phonetic description, Jakobson's theory characterises features primarily in acoustic or auditory terms. The motivation for this is to be found in the act of communication which, according to Jakobson, depends on the possession of a common linguistic code by both speaker and hearer, and this can only be found in the sound which passes between them, rather than in the articulation of the speaker. Jakobson collaborated with the Swedish acoustic phonetician Gunnar Fant in the investigation of acoustic aspects of oppositions (cf. Jakobson et al. 1951), using the recently developed sound spectrograph, and was thus able to devise a set of acoustic or auditory labels for features, such as 'grave', 'strident', 'flat', etc., each defined primarily in terms of its acoustic properties, and only secondarily in terms of the articulatory mechanisms involved.

The use of acoustic features allows a number of generalisations which are more difficult to achieve in articulatory terms [*see* ARTICULATORY PHONETICS]. The same set of features may be used for consonants and for vowels; for example, back and front vowels are distinguished by the same feature, 'grave' vs. 'acute', as velar and palatal consonants. The same feature 'grave' may be used to group together labial and velar consonants on account of their 'dark' quality and oppose them to both dentals and palatals.

In later revisions of the set of features by Chomsky and Halle (1968), this original acoustic

character of the features was abandoned in favour of articulatory definition, which is felt to be more in keeping with the speaker-orientation of generative phonology [*see* GENERATIVE PHONOLOGY].

The binary nature of feature oppositions

An important and controversial aspect of Jakobson's theory is that feature oppositions are binary: they can only have two values, '+' or '-', representing the presence or the absence of the property in question. In Prague School theory, oppositions may be 'bilateral' or 'multilateral', according to whether there are two or more than two phonemes arranged along a single dimension, and they may also be 'privative' or 'gradual', according to whether the phonemes are distinguished by the presence versus the absence, or by more versus less of a feature. But by allowing only binary features with '+' or '-', Jakobson treats all oppositions as, in effect, 'bilateral' and 'privative'. This is justified by an appeal to the linguistic code; although it is true that many phonetic distinctions are of a 'more-or-less' kind, the code itself allows only an 'either–or' classification. With oppositions, the only relevant question is 'Does this phoneme have this feature or not?', to which the answer can only be 'yes' or 'no'. Thus 'the dichotomous scale is the pivotal principle of … linguistic structure. The code imposes it on the sound' (Jakobson et al. 1951: 9).

One consequence of this is that where more than two phonemes are arranged along a single phonetic parameter or classificatory dimension, more than one distinctive feature must be used. A system involving three vowel heights, 'high', 'mid', and 'low', for example, must be described in terms of the two oppositions: [+compact] vs. [-compact] and [+diffuse] vs. [-diffuse]; 'high' vowels are [-compact] and [+diffuse], 'low' vowels are [+compact] and [-diffuse], while 'mid' vowels are [-compact] and [-diffuse].

Binary values have remained a fundamental principle of distinctive features in more recent applications of the theory, though with some reservations. In terms of generative phonology, Chomsky and Halle (1968) note that features have two functions: a phonetic function, in which they serve to define physical properties, and a classificatory function, in which they represent distinctive oppositions. They suggest that features must be binary only in their classificatory function, while in their phonetic function they may be multivalued.

The 'relational' character of features

The feature values are 'relational', i.e. '+' is positive only in relation to '-'. Each feature thus represents not an absolute property but a relative one. This allows the same contrast to be located at different points on a scale. For example, in Danish there is a 'strong' versus 'weak' opposition which in initial position is found between a pair such as /t/ vs. /d/, but which in final position is contained in the pair /d/ vs. /ð/. Though the same sound may be found on different sides of the opposition in each case, it can be treated as the same opposition, since the first phoneme is 'stronger' *in relation to* the second in both cases. Despite this relational character, however, Jakobson maintains that distinctive features are actual phonetic properties of the sounds and not merely abstract labels, since 'strength' in this sense is a definable phonetic property even if the terms of the opposition may be located at variable points along the scale. The feature itself remains invariant, the variation in its physical manifestation being non-distinctive.

The universal character of features

A major aim for Jakobson is the identification of a universal set of features which may be drawn on by all languages, even though not all will necessarily be found in every language. Thus he establishes a set of only twelve features. This means that some of the features used must cover a wide phonetic range, a notorious example being [+flat]; [+flat] phonemes are characterised as having 'a downward shift or weakening of some of their upper frequency components' (Jakobson and Halle 1956: 31), but in practice this feature is used to distinguish 'rounded' from 'unrounded', 'uvular' from 'velar', and *r* from *l*, as well as 'pharyngealised', 'velarised' and 'retroflex' sounds from sounds which lack these properties.

Many criticisms have been made of the original features and the way in which they were used. In their revision of Jakobson's feature

framework, Chomsky and Halle (1968) extend the set considerably, arguing that Jakobson was 'too radical' in attempting to account for the oppositions of all the languages of the world in terms of just twelve features. Their framework breaks down a number of Jakobson's features into several different oppositions as well as adding many more; they provide, for example, special features for clicks, which in Jakobson's framework were covered by other features. Other scholars (e.g., Ladefoged 1971) have proposed further revisions of the set of features.

The hierarchical structure of oppositions

Not all features are of equal significance in the languages of the world; some features are dependent on others, in the sense that they can only occur in a language if certain other features are also present. This allows **implicational universals**, e.g., if a language has feature B it must also have feature A.

Jakobson supports this point with evidence from language acquisition and aphasia (see Jakobson 1941). If a feature B can only occur in a language when another feature A is also present, then it follows that feature A must be acquired before feature B, and in aphasic conditions when control of oppositions is impaired, feature B will inevitably be lost before feature A. Thus, 'the development of the oral resonance features in child language presents a whole chain of successive acquisitions interlinked by laws of implication' (Jakobson and Halle 1956: 41).

Redundancy

The features utilised in specific languages are also not of equal significance; some are predictable from others. For example, in English all nasals are voiced, hence any phoneme which is [+nasal] must also be [+voice]. In the specification of phonemes, features which are predictable in this way, and which are therefore not distinctive, are termed **redundant.** In English, then, [+voice] is redundant for [+nasal] phonemes.

Redundancy of specific features is not universal, but depends on the system in question. For example, front unrounded vowels of the sort [i] and back rounded sounds of the sort [u], are found in English, German, and Turkish, but the status of the feature [+flat], i.e. rounded, is different in each case. Rounding is redundant for both types of high vowels in English, since the rounding is predictable from the frontness or backness of the vowel. In German, where there are rounded as well as unrounded front vowels, rounding is predictable and therefore redundant only for the back vowels. In Turkish, which has both rounded and unrounded front and back vowels, rounding is redundant for neither front nor back vowels.

Table 1 gives two feature matrices for the English word *dog*, one (a) fully specified, the other (b) with redundant feature values marked by 0. Since there is no opposition between [+flat] (rounded) and [-flat] (unrounded) consonants in English, and since [+grave] (back) vowels are all rounded, the specification of the feature 'flat' is unnecessary. Similarly, all [+nasal] consonants are [+continuant], hence [-continuant] consonants must be [-nasal]; there are also no nasal vowels in English, hence [-nasal] is redundant for the vowel. All vowels are [+continuant], and all non-tense phonemes are [+voice], while neither vowels nor [-compact], [-continuant] consonants can be [+strident]. All these restrictions are reflected in the 0 specifications in the matrix.

Redundancy also applies in sequences. If a phoneme with feature A must always be followed by a phoneme with feature B, then the latter feature is predictable, and therefore redundant, for the second phoneme. For example, English has /spin/ but not */sbin/: voiced plosives are not permitted after /s/. Hence the

Table 1 Two feature matrices for *dog*

	(a)			(b)		
	/d/	/ɒ/	/g/	/d/	/ɒ/	/g/
vocalic	−	+	−	−	+	−
consonantal	+	−	+	+	−	+
compact	−	+	+	−	+	+
grave	−	+	+	−	+	+
flat	−	+	−	0	0	0
nasal	−	−	−	0	0	0
tense	−	−	−	−	−	−
continuant	−	+	−	−	0	−
strident	−	−	−	0	0	−
voice	+	+	+	0	0	0

feature [-voice] is redundant for /p/ in this context.

As a further illustration, consider the possible beginnings of English syllables. If phonemes are divided into major classes using the features [vocalic] and [consonantal], we obtain the four classes of Table 2.

English syllables can only begin with: V, CV, LV, HV, CCV, CLV or CCLV. There are thus three constraints on sequences:

1. A [-vocalic] phoneme must be [+consonantal] after C.
2. CC must be followed by a [+vocalic] phoneme.
3. L must be followed by V.

Hence the sequence CCLV, which is fully specified for these features in Table 3a, can be represented as in 3b.

Natural classes and the evaluation measure

The assignment of features to individual phonemes is not arbitrary, but is intended to reflect **natural classes** of sounds. In terms of feature theory, a natural class is any group of phonemes which has fewer feature specifications than the total required for any one phoneme. Thus, as the class becomes more general, the number of features required decreases, e.g.:

/p/	[-compact], [+grave], [+tense], [-continuant)
/p, t, k/	[+tense], [-continuant]
/p, t, k, b, d, g/	[-continuant]

On the other hand, any set of phonemes which does not constitute a natural class, e.g., /p/, /s/, /a/, cannot be grouped together using a smaller number of features than is needed for any one of them.

Table 2

	Vocalic	*Consonantal*
V = vowel	+	−
C = 'true' consonant	−	+
L = 'liquid' (*l*, *r*)	+	+
H = 'glide' (*h*, *w*, *j*)	−	−

This principle, together with that of redundancy, means that features are able to achieve generalisations which are not possible in the case of phonemes. The more general a description is, the smaller will be the number of features that are required. This allows the use of an evaluation measure, a **simplicity metric**, for descriptions, based on the number of features used.

In order to ensure that the description is also evaluated in terms of 'naturalness', Chomsky and Halle (1968) reintroduce the notion of **markedness**. Trubetzkoy (1939) used this concept; the **marked term** of an opposition was for him that phoneme which possessed the feature, as opposed to that which did not. Chomsky and Halle extend the notion so that the unmarked value of a feature can be '+' or '-', according to universal conventions. Thus, the phonological matrices include 'u' and 'm' as well as '+' and '-' and there are rules to interpret these as '+' or '-', as appropriate. For evaluation, only 'm' is taken into account, hence '0' is unnecessary. This proposal was not, however, widely accepted.

The phonetic content of the features

The set of features required and the phonetic characteristics ascribed to them have been, and continue to be, subject to change. Jakobson's original twelve features, with an approximate articulatory description in terms of International Phonetic Alphabet (IPA) categories, are:

- vocalic/non-vocalic (vowels and liquids vs. consonants and glides);
- consonantal/non-consonantal (consonants and liquids vs. vowels and glides);
- compact/diffuse (vowels: open vs. close; consonants: back vs. front);

Table 3

	(a)				(b)			
	C	C	L	V	C	C	L	V
vocalic	−	−	+	+	−	−	0	0
consonantal	+	+	+	−	+	0	+	0

- grave/acute (vowels: back vs. front; consonants: labial and velar vs. dental and palatal);
- flat/plain (rounded vs. unrounded; uvular vs. velar; *r* vs. *l*, pharyngealised, velarised, and retroflex vs. plain);
- sharp/plain (palatalised vs. non-palatalised);
- nasal/oral;
- continuant/interrupted (continuant vs. stop);
- tense/lax (vowels: long vs. short; consonants: fortis vs. lenis);
- checked/unchecked (glottalised vs. non-glottalised);
- strident/mellow (affricates and fricatives: alveolar vs. dental, post-alveolar vs. palatal, labiodental vs. bilabial);
- voiced/voiceless.

The feature framework of Chomsky and Halle is very complex, but the most important differences from Jakobson, apart from the use of articulatory rather than acoustic features, are:

1. Use of the feature **sonorant** vs. **obstruent** in addition to vocalic and consonantal. Vowels, glides, nasals, and liquids are [+sonorant]; the rest are [-sonorant].
2. Use of the features **anterior**, **coronal**, **high**, **back** and **low** in place of 'compact', 'grave', 'sharp', and some uses of 'flat'; other uses of 'flat' are catered for by other features, e.g., **round**.

For place of articulation, the main differences between the two frameworks are given in Table 4.

Later developments

In the 1970s, generative phonology [*see* GENERATIVE PHONOLOGY] was more concerned with rule systems than with features, and generally assumed Chomsky and Halle's framework with only minor modifications and additions. The rise in the 1980s of **non-linear** generative phonology, however, brought renewed interest in the nature of phonological representations and new developments in feature theory, particularly in the field of **feature geometry** (see Clements 1985; Clements and Hume 1995). In the approach of Jakobson or Chomsky and Halle, features are essentially independent properties of individual phonemes or segments; in non-linear, and especially **autosegmental** phonology, they are represented separately from segments, as independent 'tiers' linked to segmental 'timing slots'. It is claimed that these tiers are arranged hierarchically, so that individual feature tiers

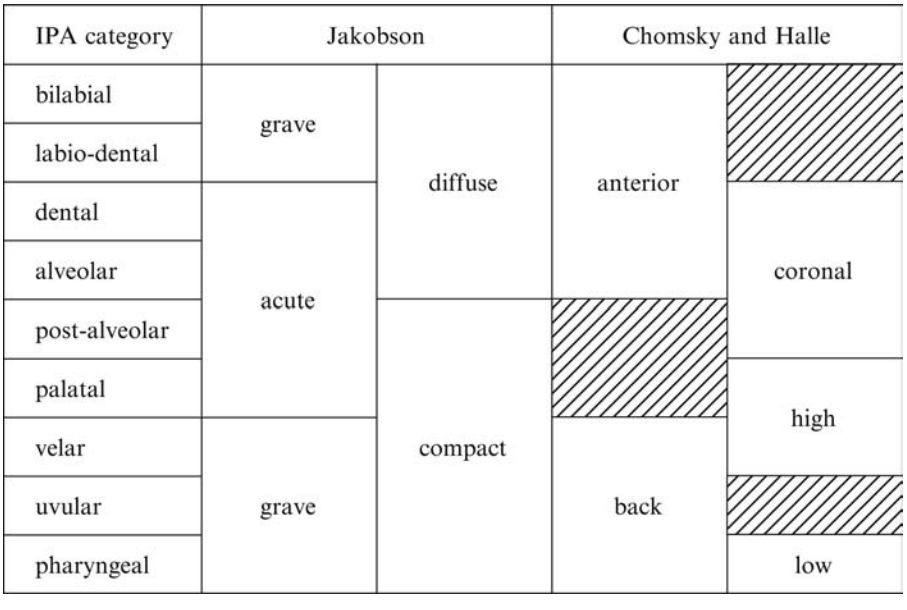

Table 4

may be grouped together under, e.g., 'place' and 'manner' tiers, these being dominated by a 'supralaryngeal' tier. 'Supralaryngeal' and 'laryngeal' tiers are in turn dominated by a 'root' tier. Such an arrangement of feature tiers, which is justified by the fact that features behave as classes in phonological processes such as assimilation, can no longer be represented as a two-dimensional matrix.

A. F.

Suggestions for further reading

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Chomsky, N. and Halle, M. (1968) *The Sound Pattern of English*, New York: Harper & Row.

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Dyslexia

The term 'dyslexia' (from the Greek *dys* – 'impaired' – and *lexis* – 'word') refers to an impairment in the ability to read and spell that is not due to low intelligence or lack of educational opportunity. Several attempts have been made to identify sub-types of dyslexia but the most widely accepted ones are the acquired dyslexias and developmental dyslexia.

Acquired dyslexia

Acquired dyslexia is a reading impairment that results from brain injury in individuals with previously normal reading ability. There are two sub-types: peripheral and central acquired dyslexias. In **peripheral acquired dyslexia** there is an impairment in the visual analysis of letters and words, while in **central acquired dyslexia** there is an impairment in one of the two routes necessary for reading. These are **the semantic (or lexical) route**, whereby familiar words are recognised visually as whole entities in the mental lexicon, and the **phonological (or sub-lexical) route**, by which unfamiliar words are read by converting their constituent letters/letter clusters (graphemes) into their corresponding sounds (phonemes) according to the grapheme-phoneme correspondence rules of the language. For example, to read the unfamiliar word 'cat' the reader must first convert the printed word into its corresponding sounds /k/, /a/, /t/.

The three most common peripheral acquired dyslexias are **word-form dyslexia**, **neglect dyslexia** and **attentional dyslexia**; the three most common central acquired dyslexias are **deep dyslexia**, **surface dyslexia** and **phonological dyslexia**. Another type, **visual dyslexia**, traverses the boundary between peripheral and central types.

Word-form dyslexia

Individuals with word-form dyslexia (or '**pure alexia**') are unable to recognise words immediately (even words they have written), but can when given time to name the words' constituent letters. This letter-by-letter reading is slow and, in the most severe cases, may be unreliable if the recognition of individual letters is impaired. For example, individuals may respond with 'c, a, t … cat' when presented with the word 'mat', because they read on the basis of letters that they perceive rather than the letters that are actually printed.

Word-form dyslexia is associated with injury to the **left occipito-temporal cortex**, also called the **visual word-form area** (but see Price and Devlin 2003), which forms part of a network involved in processing the written form of letters, words and word-like stimuli. This network runs from the brain's primary visual areas, through the temporal cortex and on to regions involved in processing the spoken form of letters and words, and the meaning of words and sentences.

Disconnection within this network has also been implicated in word-form dyslexia. It is possible that to compensate for this disconnection, individuals rely on the visual and perceptual functions of the intact right hemisphere. Once the right hemisphere has identified the letters, this information is sent back to the speech areas of the left hemisphere where the letter sounds are accessed, the individual 'hears' the word spelled out and is (usually) able to recognise it.

Neglect dyslexia

Neglect dyslexia is characterised by a failure to read letters that occur in the initial or final

positions of words. The end of a word may be read correctly by an individual with left neglect dyslexia, but the beginning of the word will be either ignored or read incorrectly. Conversely, an individual with right neglect dyslexia may read the beginning of a word correctly, but ignore or read incorrectly the end of the word. For example, 'cage' might be read as 'age', 'milk' as 'chalk', or 'girth' as 'girl'. When asked to define a read word, individuals will misread the word and define the word they believed they read (e.g., seeing the word 'liquid', they might respond with 'squid … a kind of sea creature'). This suggests that the problem occurs at the level of visual analysis, prior to accessing the word's meaning. Neglect dyslexia is associated with damage to the right hemisphere, especially the parietal lobe, a region involved in the early spatial analysis and binding of word features.

Attentional dyslexia

Individuals with attentional dyslexia are capable of reading single letters and single words but are impaired at identifying particular letters within words and reading words surrounded by other words. Interference effects are commonly experienced as letters appear to migrate between words, and individuals will often complain of letter crowding. For example, shown the words 'win' and 'fed', a person with attentional dyslexia might read them as 'fin' and 'fed'. Interestingly, where letters migrate between words, they tend to maintain their position, so an initial letter from one word will replace the initial letter of the word next to it. Letter-migration errors can be reduced by increasing the space between words, by occluding words next to the to-be-read word, by presenting words in different cases (upper or lower), or by asking the individual only to read words that are presented in a particular case.

As with neglect dyslexia, attentional dyslexia is associated with damage to the parietal lobe, but in the left cerebral hemisphere, and the symptoms explained in terms of failure of letter-to-word binding.

Visual dyslexia

Reading errors in visual dyslexia involve confusing visually similar words, for example, 'calm' might be read as 'claim', or 'arrangement' as 'argument'. The errors might be the same as those made by unimpaired readers who glimpse words briefly. Real words are read more accurately than are non-words, and words with few orthographic neighbours (words with which they share common letters) are read more accurately than are words with many orthographic neighbours.

Visual dyslexia is rare, and little is known about its underlying cause, although it is believed to involve either the visual analysis system (letters and words are incorrectly identified) or the visual input lexicon (correctly analysed letters and words may trigger the selection of an incorrect representation in the phonological output lexicon). Because of this confusion, visual dyslexia is considered to lie on the boundary between the peripheral and central acquired dyslexias.

Deep dyslexia

Deep dyslexia describes a severe, rare, impairment in the ability to read. Concrete nouns can be read although they are frequently replaced by either visually related words (e.g., reading the word 'sour' as 'soup'), morphologically related words (e.g., reading the word 'sexist' as 'sexy'), or semantically related words (e.g., reading 'dream' as 'sleep'; these substitutions are known as **paralexias**). **Abstract words** (e.g., 'unusual') and **function words** (e.g., 'and', 'the', 'so') are very rarely read successfully, and the apparent inability to apply grapheme–phoneme correspondence rules renders individuals unable to read or spell pronounceable non-words.

This form of dyslexia is associated with extensive damage to the left hemisphere. As the predominant difficulty involves grapheme–phoneme conversion and the ability to produce words that are context-appropriate, the disorder may result from lesions to areas responsible for phonological decoding and disconnection between the mechanism responsible for the visual recognition of words and that responsible for speech (Price et al. 1998).

Phonological dyslexia

Phonological dyslexia is very difficult to detect as individuals retain the ability to read most regular and irregular words but are unable to read even

the simplest pseudowords. While real words are familiar and may be read by the lexical route, lexical entries do not exist for pseudowords (e.g., 'fip') which the individual has never seen. This reliance on whole-word reading indicates that phonological dyslexia is the result of a specific impairment in the phonological pathway. Little is known about the cortical basis of this disorder although frontal and temporo-parietal areas of the left hemisphere have been implicated (Galaburda et al. 1994).

Surface dyslexia

In direct contrast to individuals with phonological dyslexia, those with surface dyslexia appear to be unable to recognise words as whole units (by the lexical route). Instead, they decode words by applying grapheme–phoneme correspondence rules; this display of contrasting abilities/impairments is known as a **double dissociation**. Regular words and non-words may be read correctly, but irregular words will cause particular difficulty, especially if they are low-frequency and, therefore, unfamiliar. The individual will attempt to read them as if they were regular words – the word 'pint', for example, might be pronounced to rhyme with 'mint', the word 'phase' might be read as 'face'; these are **regularisation errors**. When irregular words are read as other, similar-sounding words, individuals, if asked to provide a definition, will provide the definition for the erroneous word rather than for the word that they actually saw (as in neglect dyslexia). One of Marshall and Newcombe's patients (1973), on being asked to read and define the word 'begin', responded 'beggin … that's collecting money'.

The exact locus of damage in surface dyslexia is unknown although it is likely to be between left hemisphere regions involved in visual word recognition and those involved in semantic processing.

Developmental dyslexia

Developmental dyslexia has been defined as

> a specific learning difficulty which is neurobiological in origin and persists across the lifespan. It is characterised by difficulties with phonological processing [e.g., recognising rhyming words or repeating non-words], rapid naming [e.g., identifying colours or objects], working memory [e.g., remembering telephone numbers or directions], processing speed [e.g., slower response times on measures of reading or spelling], and the automatic development of skills [e.g., spelling words without having to exert conscious effort] that are unexpected in relation to an individual's other cognitive abilities.
>
> (The British Dyslexia Association 2007)

Estimates of the incidence of developmental dyslexia in alphabetic languages range between 5 and 15 per cent. Although some suggest a greater prevalence of dyslexia in boys than girls (ratios of between 3:1 and 5:1 are reported), data are inconclusive.

Attempts to identify subtypes of developmental dyslexia, in line with the acquired dyslexias, have generally distinguished between two types, one characterised by a deficit in the phonological reading route, the other by a deficit in the semantic route (e.g., Boder 1973; Bakker 1992).

Developmental dyslexia can co-occur with other developmental disorders, including **dyspraxia** (difficulty with motor skills and coordination), **attention deficit/hyperactivity disorder** (difficulty with concentration, impulsivity and hyperactivity), **dysgraphia** (difficulty with handwriting), and **dyscalculia** (difficulty with numbers and mathematics).

Possible causes of dyslexia

Theoretical explanations of developmental dyslexia have been constructed around dyslexic readers' reported difficulties with phonological processing, rapid auditory (temporal) processing, visual processing and skill automatisation.

The phonological processing theory

Individuals with dyslexia have specific difficulty with processing, representing and retrieving speech sounds. When dyslexic children start school and begin alphabetic reading and spelling instruction, this difficulty manifests as impairments

in learning letter–sound correspondences (impeding the development of the **phonological route to reading**), object naming, repeating words, memory for words, and the development of a spoken vocabulary. Dyslexic readers perform poorly on tests of **rhyme awareness** (e.g., 'do the words *chair* and *bear* rhyme?'), **rhyme production** (e.g., 'can you tell me a word that rhymes with *cat?*'), **phoneme segmentation** (e.g., 'how many different sounds are there in the word *mouse?*'), **alliterative awareness** (e.g., 'do the words *fish* and *phone* start with the same sound?'), and **verbal repetition** (e.g., 'can you say after me the word *honorarium?*').

Good pre-school phonological skills predict good subsequent reading development while impaired pre-school phonological skills predict subsequent reading difficulties, including dyslexia (Lundberg 2002). When phonological deficits exist in dyslexia, they invariably persist throughout childhood and into adulthood, even in individuals whose reading ability has developed, through remedial instruction, to an age-appropriate level. On the basis of such evidence Stanovich (1990) has proposed that dyslexia represents the manifestation of a '**core phonological deficit**'.

At a biological level, dyslexia has been linked to dysfunction in left-hemisphere language areas associated with the retrieval of phonological representations. Abnormal activation in these regions during word and non-word reading, picture naming and the passive viewing of words indicates that this is likely to be the source of a primary impairment in dyslexia (Brunswick et al. 1999). Dysfunction in these regions may underlie difficulties with learning and accessing phonological codes which may explain dyslexic readers' impaired reading development.

The temporal processing theory

Phonological difficulties associated with dyslexia may be explained in terms of a broader deficit in temporal processing. For example, dyslexic readers are reported to be impaired at distinguishing between pairs of tones presented with a short inter-stimulus interval but not those with a longer inter-stimulus interval (Tallal et al. 1993). However, while dyslexic readers are significantly poorer than unimpaired readers at distinguishing between rapidly presented speech sounds, this difference disappears when the stimuli are slowed down.

The ability to perceive short sounds and sound transitions is important for the processing of non-speech stimuli (e.g., auditory tones) but it is absolutely crucial for the perception of speech (e.g., to distinguish between the spoken words 'cat' and 'bat'). Impairment in this ability will directly hinder the development of the child's phonological processing skills, and subsequently, their reading.

This theory has proved controversial, however, as not all dyslexic readers show temporal processing deficits, not even those with the poorest phonological processing skills, and the relationship between temporal processing deficits, phonological deficits and impaired reading appears to be too unreliable to form the basis of a credible explanation of dyslexia (see Ramus 2003).

The visual processing/magnocellular theory

Difficulties with visual processing – poor binocular convergence and fixation stability (difficulty focusing the eyes), and an impaired ability to track a left-to-right moving target visually – may co-occur with phonological deficits to impair **reading development** in children (Stein and Walsh 1997). These visual difficulties are more commonly reported in dyslexic than unimpaired readers and may explain the phenomenon whereby letters and words appear to 'swim' around on the page.

While phonological deficits are central to developmental dyslexia, historically, the disorder was considered to be primarily visual-perceptual. Hinshelwood (1895), for example, wrote of '**word blindness**', Morgan (1896) of '**mind blindness**' and Orton (1928) of '**strephosymbolia**' (the perceived twisting, or reversal, of printed symbols). Visual impairments (e.g., an impaired ability to copy and match complex visual figures) have been observed in some dyslexic readers, but not all, leading proponents of this theory to argue that dyslexic readers are impaired on tasks requiring motion sensitivity.

Vision is mediated by two parallel layers in the visual system: one (the parvocellular layer) is involved with the processing of colour and fine detail, the other (the magnocellular layer) with

the detection of orientation, movement and depth perception. Abnormality in the magnocellular layer is believed to produce visual-perceptual instability when dyslexic individuals read although attempts to link dyslexia with impaired sensitivity to rapidly changing visual stimuli fail to find empirical support (e.g., Stuart et al. 2006).

It has been suggested that similar abnormality in the auditory system (in neurons specialised for processing rapidly changing auditory stimuli) may explain impaired phonological processing in dyslexia. Again, however, evidence is inconsistent.

The automaticity/cerebellar theory

Another model considers the relationship between dyslexia and difficulties in learning new skills. As a new skill (e.g., reading or writing) is mastered, the amount of conscious attention that needs to be paid to it decreases – the skill becomes automatic. Failure to develop automaticity in any of the sub-skills required for reading and writing will cause dyslexic readers to lack fluency in their reading, their spelling will be laboured, and they will experience difficulties in class when listening to the teacher and making notes. Evidence is provided by studies of dyslexic children who perform a single (balance) task with little difficulty, but whose performance becomes significantly impaired when they are required to perform this task alongside a concurrent cognitive task, dividing their attentional resources (Nicolson et al. 2001). Other researchers, however, have managed only a partial replication, or they have failed to replicate these findings (Ramus et al. 2002).

Of central importance to this theory is the **cerebellum**, a structure at the base of the brain which contributes to skill automatisation, motor function, posture and balance; research also implicates it in reading and speech perception. Failure in the automatic processing of speech sounds, speech articulation, grapheme–phoneme translation and motor impairments associated with clumsiness and poor handwriting might be caused by cerebellar dysfunction.

Brain-imaging studies report reduced activation in the cerebella of dyslexic readers during tasks involving motor sequencing, reading and word/non-word repetition (e.g., Paulesu et al. 2001). These studies also found differences between dyslexic and unimpaired readers in many other brain regions. It is worth noting that where cerebellar abnormalities are found in dyslexia, these may be due not to dysfunctional development related to impaired reading, but to a lack of practice in reading and writing which affected how the cerebellum developed.

Overcoming dyslexia

Dyslexia cannot be 'cured', but the use of appropriate teaching can help overcome many of the reading, writing and spelling difficulties associated with it. Successful methods involve teaching the relationship between letters and their corresponding sounds in a cumulative and structured way, building from individual letters/letter clusters, through single-syllable words to multi-syllable words. Conditional letter–sound 'rules' are also taught (e.g., if the letter 'c' is followed by an 'e', 'i' or 'y' it is pronounced /s/, if it is followed by an 'a', 'o' or 'u' it is pronounced /k/). This teaching is 'multisensory', involving the visual, auditory and tactile modalities; for example, while showing a written letter or string of letters (e.g., 'b' or 'tion'), and saying its sound (/b/ or /shun/), the teacher encourages a child to repeat the sound while making the shape of the letter with their hands, with clay, or with pipe-cleaners, or to trace its shape on sandpaper. As the child sees the letter, and says its sound, they 'experience' its shape through touch to produce a stronger multisensory memory.

This method of teaching takes the emphasis away from the strongly visual-auditory mainstream approach which disadvantages dyslexic children by focusing on the processes with which they have most difficulty. Evidence shows that dyslexic (and non-dyslexic) children educated using phonics-based, multisensory teaching make significant gains in their reading and spelling development.

N. B.

Suggestions for further reading

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E

English Language Teaching

English Language Teaching (ELT) is also referred to as **TEFL** (Teaching English as a Foreign Language) or (especially in the USA) as **TESOL** (Teaching of English to Speakers of Other Languages). A distinction is often made between the teaching of English in a context where it is not the ambient language (**EFL** or English as a Foreign Language) and the teaching of English in a target-language environment (**ESL** or English as a Second Language). However, the term **second language** (L2) is often used in a broader sense that embraces both EFL and ESL situations. In the UK, the acronym **ESOL** (English for Speakers of Other Languages) is used to refer specifically to the teaching of English to immigrant populations.

The use of English, and with it the need to teach the language, has expanded enormously in the past sixty years. This is partly the result of the language's history in areas of former British influence and partly because of the global importance of the US economy. English is now more accessible worldwide than it has ever been before, thanks to new technology, especially the Internet and podcasting. It has become a *lingua franca* in contexts such as business negotiation, tourism, academe, diplomacy and the media, and a quarter of the world's population is estimated to use English. Those who acquired it as a foreign language plus those who have it as a second or official language greatly outnumber first-language speakers (Crystal 2003).

History of ELT

A distinctive approach to teaching modern languages first emerged in the early nineteenth century. This **grammar-translation method (GT)** was modelled on the way Classics had traditionally been taught. New language was presented by means of lists of vocabulary, abstract rules of grammar and paradigmatic tables displaying inflections. The learner used the information to translate contrived sentences into and out of the target language. In the later years of the century, GT was challenged by a number of educationalists, notably Sauveur (1874), who used demonstration to elicit spoken responses, and Gouin (1892), who argued for a closer alignment with first-language acquisition. In 1878, Berlitz launched his Method, in which the teaching was oral and based upon tightly controlled question-and-answer sequences.

Concerns about GT grew with the **Reform Movement**'s assertion of the primacy of spoken language; and the first major work of ELT methodology (Palmer 1922) recommended a focus upon the teaching of oral skills. Palmer pointed out that learning about a language is not the same as learning to use one. He therefore contended that language is best taught concretely and by example rather than rule. From the 1930s onwards, teaching materials in many parts of the world moved away from rule-based **deductive** teaching to **inductive** approaches where new forms were contextualised by means of short dialogues and reading texts.

An important influence on ELT course design from the 1930s to the 1960s was the **structuralist** movement in linguistics, with its emphasis upon linguistic form. Syllabuses focused on the teaching of discrete grammar points and sentence patterns. The forms to be taught were graded in terms of supposed difficulty and presented

contrastively. A parallel influence was the growth of **behaviourism** in psychology. As early as Palmer, the acquisition of a second language was depicted as a matter of forming new habits and suppressing old ones associated with the first language (L1). Importance was therefore attached to intensive oral repetition and practice. This trend was boosted by the arrival in the 1950s of **language laboratories** where learners could perform oral grammar drills for extended periods. A particularly rigid form of rule-based instruction and drilling emerged in the **audiolingual** method first used to teach Japanese to American servicemen after the Second World War. In areas with a British methodological tradition, an inductive approach known as **direct method teaching** was used; but here too there was heavy emphasis on controlled practice.

The 1970s brought a reaction against form-based structuralist syllabuses. With the growth of interest in **pragmatics**, a view gained ground that it was preferable to structure course design around speakers' intentions expressed in the form of language **functions** such as threatening, offering, inviting, etc. rather than points of grammar. The resulting **notional-functional approach** (Wilkins 1976) proved problematic as the basis for a complete curriculum. However, it contributed to a wider shift in perspective which questioned the meaningless nature of many of the activities that took place in the language classroom. It was argued that learners should not simply be manipulating linguistic forms at the behest of the teacher but should be using the target language for a communicative purpose. This principle continues to underpin most current approaches to ELT, referred to collectively as **Communicative Language Teaching** (CLT).

The format adopted by early CLT practitioners was not new. A traditional **structuralist lesson** fell into three phases: presentation, controlled practice and free practice, often referred to as **PPP**. CLT shifted the emphasis onto the third phase, which had often been neglected. Free practice was viewed as a means of enabling learners to form and test hypotheses about the target language and thus to advance their own partly developed **interlanguage** (Selinker 1972).

Some methodologists took a step further and proposed a **process syllabus**, based upon a set of graded communicative tasks rather than a list of discrete points of grammar (White 1988). From this developed an approach known as **task-based learning** (van den Branden 2006; Willis and Willis 2007). Task-based learning has gained acceptance in many quarters, but there is little consensus as to whether language should be allowed to emerge incidentally from the task or whether tasks should be designed to elicit individual forms that the teacher intends to target.

An important development in the 1980s was the recognition that certain learners of English have specific needs. They might not wish to develop all four language skills to the same degree, might have to perform in particular contexts and genres and might require specialist lexis and syntax. Institutions asked new entrants to complete a **needs analyis** questionnaire; and two types of specialist course became available. One caters for those who intend to study though the medium of English or in an English-speaking country. A course in **English for Academic Purposes** (EAP) aims to cover both language requirements and essential skills such as academic writing or lecture listening (Jordan 1997). The second type, known generally as **English for Special Purposes** (ESP) embraces a range of specialist courses in areas such as English for Engineering, English for Medicine, Business English, etc. (Robinson 1991; Dudley-Evans and St John 1998). A challenge for ESP course design lies in the interface between general English and the language of the discipline. It is hard to provide authentic technical texts until the learner has achieved quite a high level of non-specialist linguistic knowledge; but delaying the introduction of the ESP component can reduce motivation.

Another major issue in ELT since the 1980s has been learner **autonomy** (Benson and Voller 1996). One line of enquiry has examined the function and practicality of resource centres where students can practise their language skills independently. A second has explored ways in which students can be equipped with **learning strategies** (Ellis and Sinclair 1989) that enable them to notice, retain and retrieve the forms of language more successfully.

Phonology, lexis and grammar

ELT adopts the conventional linguistic categories of phonology, lexis and grammar. Across all three areas, the approach is usually contrastive, with learners taught to discriminate between items that share formal or semantic characteristics.

Initial approaches to the teaching of English pronunciation set great store by accurate articulation at segmental level. Typically, teachers worked through the full set of phonemes, which were contrasted by means of **minimal pairs** (*pack/back*, *pack/pick*, etc.) However, with the advent of communicative priorities in the 1970s, it was increasingly accepted that instructors should aim not for native-like articulation but for an acceptable level of intelligibility. Intelligibility has proved difficult to define, but teachers have generally moved towards a more integrated approach to pronunciation, with suprasegmental aspects accorded their due importance (Dalton and Seidlhofer 1995).

Structuralist approaches treated vocabulary as subordinate to grammar on the grounds that learners could acquire it incidentally. However, in the late 1980s there was a resurgence of interest in lessons focusing on lexis (Carter and McCarthy 1988; Schmitt and McCarthy 1998). A first approach was to present words in lexical sets; assertions that this led to cross-association were not supported by evidence. More recent practice takes account of the growing understanding of how words are stored in the **mental lexicon** and also reflects the influence of **corpus linguistics.** There is particular interest in **collocation**, which is notoriously difficult to teach, and in the important part played by **formulaic chunks** (Pawley and Syder 1983), which not only assist lexical retrieval but also contribute to spoken fluency.

Deductive and inductive approaches to the teaching of grammar have already been mentioned. In some early inductive methods, the use of grammar rules was quite strictly proscribed. However, this stance has since been modified; and good practice today favours using rules to consolidate learning once language has been presented in context. There has been considerable discussion of whether learners need to direct specific attention to linguistic form in order to acquire a particular feature – **noticing the gap** between what a native speaker says and what they themselves might say in the same circumstances. It has led to sharp divisions between those who favour **focus on form** through general exposure to the L2 by means of language-based tasks and those who favour continuing to target specific points of grammar (a focus on *forms*) (Doughty and Williams 1998).

Ideas from **second language acquisition** (SLA) are often slow to affect approaches to grammar. However, the notion of **transfer** from L1 to L2, much investigated in early SLA research, continues to be influential. Many ELT course designers use **contrastive analysis** as the basis for designing grammar programmes, despite evidence that partial similarities are often more problematic than differences. Another early area of SLA, **error analysis**, demonstrated the value of categorising learners' mistakes and provided a framework for doing so. It also drew attention to the role of teacher feedback. More recently, cognitive models of language acquisition have strengthened the argument for **communicative practice** (to enable users to streamline and co-ordinate processes) but have also directed attention back to the value of **intensive practice** (to achieve more automatic processing).

Skills instruction

Until the late 1960s, language skills were subordinated to the teaching of form. Reading and listening served to introduce new points of grammar; writing and speaking were used as a means of reinforcing recently learnt language. However, it became apparent that the skills in question deserved to be practised in their own right. A tradition of **language testing** developed (seen most clearly in the Cambridge ESOL suite of exams) which tested performance rather than linguistic knowledge and which recognised that a learner's competence might vary from one skill to another.

Speaking

In the early days of ELT, speaking practice chiefly took the form of 'conversation' sessions or of class discussions on set topics. These formal

activities later gave way to role plays and simulations of real-life encounters. With the advent of CLT, the need was felt for tasks with a greater communicative purpose. Especially favoured are those which provide an **information gap** between two speakers, one of them in possession of facts that the other needs to ascertain (Ur 1981). There have been recent attempts to identify the performance features that contribute to fluency so that these aspects of speech production can be targeted.

Writing

Writing practice in ELT originally required learners to imitate short paragraphs using linkers to signal inter-sentential connections. Under the influence of discourse analysis [*see* DISCOURSE ANALYSIS], attention switched to patterns at text level, usually illustrated by simple diagrams. However, this modelling approach later gave way to one that reflected new psychological insights into the parts played by planning and revising. In **process writing** (White and Arndt 1991), learners work cooperatively in pairs or small groups to produce the first draft of a text, and submit it to others for comments and possible corrections. The draft is then reworked, sometimes several times and sometimes with interventions by the teacher. Some commentators (e.g., Hyland 2003) argue that the method gives too little attention to rhetorical considerations such as the writer's goals and the intended reader. They propose an alternative **genre approach**, where learners study models of particular types of writing in order to emulate them.

Reading

The teaching and testing of reading in ELT was originally based on methods used in L1 contexts, with learners studying a text, noting new vocabulary and answering comprehension questions. This approach provided experience of reading English material but did not improve learners' performance in any systematic way. The solution proposed (Nuttall 1982) was to divide the reading construct into a set of component parts or *sub-skills* and to practise them individually by means of small-scale tasks. The approach is now widely adopted in ELT; but it is not without its critics, who point out that the sub-skills targeted are very miscellaneous, have been identified on the basis of intuition and may have no psychological reality. There is also a body of opinion which holds that instructors do better to focus upon the language used in the texts rather than trying to teach L2 reading as a skill (see Alderson 1984), and that the most effective support is the teaching of vocabulary. A **threshold hypothesis** holds that readers need a minimum number of words in order to transfer established processes from their first language. However, there is little agreement as to what the percentage of known words in a text must be. Discussion also tends to ignore evidence that the vocabulary level needed depends upon the type of text and how it is to be read.

Listening

The teaching of listening emerged quite late, and relied heavily upon the comprehension-based approach employed in reading. As with reading, a common criticism is that the approach tests general understanding but does nothing to produce better listeners. In addition, it draws upon skills other than the target one: learners may have to employ reading for interpreting the questions and writing or speaking for reporting the answers. There have therefore been recent suggestions (Field 2008) for a componential approach similar to the sub-skills one in reading, but based upon the processes identified in psycholinguistic models of first-language listening. A parallel development has been the growing recognition of the importance of accurate word-level decoding, after many years when it was tacitly assumed that listeners could resolve most problems of understanding by the use of context.

A widely discussed issue in L2 reading and listening has been the use of **authentic materials** in the form of texts and recordings not specifically designed for language learning purposes. There is agreement that learners benefit from early exposure to the patterns and rhythms of English and from the experience of dealing with material which has not been simplified. However, some commentators have raised the question of how authentic these texts can be said to be if they are employed for classroom tasks

very different from those for which they were intended.

Important to the teaching of all four skills is an understanding of the strategies which learners use in order to compensate for their limited linguistic knowledge and limited experience of performing in L2 (Faerch and Kasper 1983; Cohen and Macaro 2008). These are termed **communication strategies** (or **strategies of use**), as distinct from the **learning strategies** which assist autonomy (see above). Attempts to identify strategies have sometimes resulted in diffuse taxonomies of varying levels of generality. In addition, commentators have mainly used the productive skills as their point of reference, overlooking strategies specific to listening and reading. A much-discussed issue is whether strategy instruction represents a good use of class time. Some argue for the explicit teaching of individual strategies; others maintain that strategies taught in this way do not become integrated into performance.

Research and training

ELT has developed a tradition of teacher-led research into areas such as teacher and learner beliefs, group dynamics or the effects of methodology upon learning. This kind of classroom research is increasingly viewed as an important part of professional development, providing insights into the language problems of specific sets of learners and into the effects of the teacher's own instructional style. Examining **classroom discourse** enables practitioners to study teacher questions and feedback, learner interaction and the role of the first language. Also favoured is an **action research** approach, where an aspect of language is taught through several cycles, each involving change of some kind followed by reflection.

The training of teachers for the profession remains fragmented. On the US model, it takes place mainly at masters level. Elsewhere in the English-speaking world, it usually consists of a practical training course with a focus on methodology, the most internationally recognised qualifications being the Cambridge Certificate and Diploma. EFL teachers trained for national secondary systems tend to adopt local traditions of methodology, shaped by their own materials, curriculum and educational history. Until recently, some of them had access to new ideas through in-service training programmes and scholarships provided by English-speaking governments. Sadly, cutbacks in funding and the decline of bodies such as the British Council mean that teachers in poorer countries with limited technological resources are increasingly denied contact with new developments.

J. F.

Suggestions for further reading

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F

Forensic linguistics

In 1968, Jan Svartvik published *The Evans Statements: A Case For Forensic Linguistics*, in which he demonstrated that disputed parts of a series of statements which had been dictated by Timothy Evans to police officers and which incriminated him in the murder of his wife, had a grammatical style measurably different from that of uncontested parts of the statements, and a new discipline was born.

For the purpose of this article, I will take 'forensic linguistics' in its widest possible meaning, embracing all descriptions of language undertaken for the purpose of assisting courts and thus will, somewhat contentiously, subsume forensic handwriting analysis and forensic phonetics under this general label. Forensic linguists help courts to answer three questions about a text – what does it say, what does it mean and who wrote, typed or authored it?

What does the text say?

For the phonetician, this may be a question of decoding a few crucial phrases, words or even single syllables – indeed more than one case has depended on the placement of tonic stress or the discrimination of a single phoneme. When a recording is of poor quality the non-expert may hear one thing, while the expert, with a trained ear and with the help of sophisticated equipment, which can enhance the quality of the recording, may perceive something entirely different. In one case an indistinct word, in a clandestine recording of a man later accused of manufacturing the designer drug Ecstasy, was crucially misheard by a police transcriber as the contextually plausible 'hallucinogenic': 'but if it's as you say it's *hallucinogenic*, it's in the Sigma catalogue', whereas what he actually said was, 'but if it's as you say it's *German*, it's in the Sigma catalogue.'

In another case a man accused of murder, who had a strong West Indian accent, was transcribed as saying that he got onto a train and then 'shot a man to kill'; in fact what he said was the innocuous and contextually much more likely: 'showed a man ticket'.

For the handwriting expert, providing the court with an opinion on what a text 'said' was traditionally a question of deciphering handwriting which was illegible to the layman. In the past twenty years, however, a machine called by the acronym ESDA (Electro-Static Detection Apparatus) has become an indispensable additional tool through which the expert often discovers new evidence, rather than simply analyses existing evidence (see Davis 1994). Essentially this machine allows the user to read the indentations created by writing on the sheet of paper above. Thus, if a writer were using a block or pile of paper while writing, as would typically happen during police statement taking, each sheet would carry an indentation record of preceding sheets. It was ESDA evidence which led directly to the disbanding of the West Midlands Serious Crime Squad, when a disputed page of a supposedly contemporaneous handwritten record of an interview was shown to have imprinted on it an earlier and uncontentious version of the same page, which had apparently been rewritten to include two incriminating utterances.

What does (part of) a text mean?

A significant number of texts are produced by lawyers specifically for communication with a lay audience – contracts, health warnings, the Police Caution and its American equivalent the Miranda Warning, etc. By their very nature such texts have inherent problems in that, on the one hand, they are designed to be legally unchallengeable, but, on the other, that very fact may make them at best opaque and at times incomprehensible to their intended readers.

Forensic linguists work on such texts for two purposes: sometimes they are asked to give a professional opinion, when a dispute about meaning goes to court – for example, in one case a man was refused a payout on a sickness insurance policy because it was said that he had lied when, in completing a health insurance proposal form he replied 'No' to the following question: 'Have you any impairments? … Loss of sight or hearing? … Loss of arm or leg? … Are you crippled or deformed? … If so explain. … ' The insurance company asserted that he did indeed have 'impairments' on the grounds that 'he was overweight, had a high cholesterol level and occasional backaches', even though they did not dispute his assertion that none of these conditions had ever caused him to take any time off work. In her evidence in support of the claimant, Prince (1981: 2) focused on the vagueness of the word 'impairment', and argued that any 'cooperative reader' would reasonably infer that, given the phrases that followed it, the word 'impairment' in this question was being used to mean a relatively severe and incapacitating physical condition and that therefore the man had indeed answered 'no' 'appropriately and in good conscience'. The court ruled against the insurance company. Other such cases involve questions of what does and does not constitute a warning, particularly when it is a short text written on a cigarette packet (Tiersma 2002).

In the majority of cases, however, courts do not call on, and indeed often explicitly forbid the use of, the expertise of linguists, because deciding on and defining the meaning of words and phrases is an integral part of the work of Courts – according to Pearce (1974) up to 40 per cent of cases require a ruling on the meaning of an expression. In the famous 1950s English case, when Derek Bentley was convicted of the murder of a policeman, even though he was under arrest at the time the policeman was shot, the lawyers argued about the meaning of the utterance 'Let him have it Chris' debating whether it meant 'Shoot him' which incriminated him in the murder or 'Give it [the gun] to him [the policeman]', which was grounds for mitigation.

Sometimes there is no legal dispute but a perceived communication problem. Forensic linguists have been involved in evaluating the communicative problems of texts like Temporary Restraining Orders, Jury Instructions, the Police Caution and the Miranda Warning, and then suggesting ways in which these texts can be modified to better express the originally intended meaning. They have also campaigned for the right of non-native speakers to have interpreters, in order to ensure that they understand what is being said to them, and that what they themselves say to the Court in return accurately conveys what they mean. Linguists campaign vigorously against dubious language tests being used to determine the country of origin of asylum seekers and have produced guidelines for such assessments (Eades and Arends 2004).

Who is the author?

Much of the work of the handwriting expert is concerned with forged handwriting – often on wills and cheques – where the little-known fact that it is possible to differentiate normal from 'careful' handwriting in terms of line quality and letter height and width, assumes great importance. Research into the differences between left- and right-handed writing, between male and female writers and between 'hands' from different countries and scripts also has obvious forensic applications.

Forensic phoneticians are sometimes called on to identify the accent of an unknown voice making obscene or threatening phone calls or ransom demands; more often they are asked to compare tape-recorded samples of known voices with samples of an unknown and sometimes disguised voice. A few forensic phoneticians work only by ear, but the vast majority use sophisticated computer programs, which, among other facilities, offer real-time analysis and the accurate visual comparison of spectrographic prints

through a split-screen presentation (Rose 2002). In addition, the phonetician may be asked to offer an opinion on whether a tape has been interfered with either physically or instrumentally, whether it is an original or a copy and which machine it was originally recorded on.

Another research concern of forensic phoneticians is with 'voice line-ups'. The problem is the design of a line-up which gives a victim who thinks they can accurately recall the voice of the criminal a fair but not unfair chance of matching their audio memory with audio recordings of the suspect voice(s). Related research questions are how much linguistic competence is needed before non-native speakers are able to distinguish voices and how linguistically competent do they need to be to perform as well as native speakers.

The forensic linguist is also concerned with the unknown or disputed authorship of written texts. In cases where there are no suspects – for example, some threatening letters and hate mail – the linguist may be asked to discover linguistic clues suggesting the nationality, regional and/or social origin or educational level of the author, scribe, or typist.

Usually, however, there is non-linguistic evidence which significantly reduces the number of potential authors – in the case of suspect suicide notes typically to only two. In such cases the linguist will usually have access to samples of other texts produced by the candidate author(s) and will be looking for distinctive lexical, grammatical and orthographic choices, as well as layout preferences. The major problem for the linguist is that they usually need much more data than do the phonetician and the handwriting expert, while most of the texts are distressingly short. Naturally, the task is made considerably easier if there are a lot of non-standard features – the authentic example below is unfortunately not typical: 'I hope you appreciate that i am enable to give my true idenitity as this wolud ultimately jeopardise my position … have so far deened it unnecessary to investegate these issus'.

Nevertheless, intending writers of anonymous letters are advised to make good use of the spelling- and grammar-checking facilities of their word-processing package! Text messages, sent from the mobile phones of people who were already dead have assumed forensic significance in a growing number of court cases (see http://news.bbc.co.uk/2/hi/uk_news/england/cornwall/5150954.stm).

There have, in the past, been many cases where an accused has claimed that the police had partially, or entirely, fabricated interview and/or statement records – British readers will recall the cases of Derek Bentley, the Bridgewater Four and the Birmingham Six. Now, in order to avoid the possibility of fabrication, interactions between the police and the accused are standardly tape-recorded in many countries and there is growing pressure to video-record. In looking at such disputed records of statements the linguist has a battery of available tests and tools. In the Derek Bentley case, for instance, it was possible to derive evidence of usage from the Bank of English corpus in order to demonstrate that one grammatical feature in the language attributed to Bentley, the use and positioning of the word 'then', was in fact typical of the register of police report-writing. In this same case evidence from both narrative analysis and research into the textual use of negatives was used to support Bentley's claim that his statement was, at least in part, the product of question-and-answer exchanges converted into monologue. In the Bridgewater Four case evidence about the uniqueness of utterance and the nature of cohesion between and within question-and-answer sequences was used to support a claim that an interview record had been fabricated.

In the main, investigations into authorship attribution use existing linguistic tools in a forensic context; however, in one area, that concerned with plagiarised text, new computerised tools are being developed and new knowledge about individual style features and the way texts are created is being generated. Recently, increased access to word-processing facilities linked with an explosion in the use of the Internet have made it much easier for students in particular to 'borrow' text and insert it seamlessly into their own. The simultaneous explosion in student numbers means that only computer-assisted techniques can hope to cope with this problem. There exists software for the automatic detection of student plagiarism when they are borrowing from fellow students (see Woolls and Coulthard 1998) or from the Internet (Turnitin – http://turnitin.com/static/

index.html). Now the search is on for style measures which will work on short texts and can therefore discover inconsistencies in essays which are partially plagiarised, or which consist of extracts from various sources sewn together (Woolls – http://www.copycatchgold.com/Citereader.html). The discipline continues to push back the frontiers of descriptive linguistics as well as its forensic applications.

M. C.

Suggestions for further reading

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Formal grammar

Formal grammars are associated with linguistic models that have a mathematical structure and a particularly abstract view of the nature of linguistic study. They came to prominence in linguistic theory through the early work of Noam Chomsky and perhaps for this reason are sometimes, though quite wrongly, associated exclusively with his school of linguistics. It is nevertheless appropriate to start with a quotation from Chomsky (1975a: 5):

> A language L is understood to be a set (in general infinite) of finite strings of symbols drawn from a finite 'alphabet'. Each such string is a sentence of L. … A grammar of L is a system of rules that specifies the set of sentences of L and assigns to each sentence a structural description. The structural description of a sentence S constitutes, in principle, a full account of the elements of S and their organisation. … The notion 'grammar' is to be defined in general linguistic theory in such a way that, given a grammar G, the language generated by G and its structure are explicitly determined by general principles of linguistic theory.

This quotation raises a number of issues. The first and most general is that a language can be understood to consist of an infinite set of sentences and the grammar of that language to be the finite system of rules that describes the structure of any member of this infinite set of sentences. This view is closely related to the notion of a **competence grammar**: a grammar that models a speaker's knowledge of their language and reflects their productive or creative capacity to construct and understand infinitely many sentences of the language, including those that they have never previously encountered. I shall assume this position in what follows.

A second, more formal, issue is that the grammar of a particular language should be conceived of as a set of rules formalised in terms of some set of mathematical principles, which will not only account for, or **generate**, the strings of words that constitute the sentences of the language but will also assign to each sentence an appropriate grammatical description. The ability of a grammar simply to generate the sentences of the language is its **weak generative capacity**; its ability to associate each sentence with an appropriate grammatical description is its **strong generative capacity**.

A third issue concerns the universal nature of the **principles** that constrain possible grammars for any language, and hence define the bounds within which the grammar of any particular language will be cast. Here we shall be concerned with two interrelated questions. The first is a formal matter and concerns the nature of the constraints on the form of the rules of the grammar. A properly formal approach to this question would be formulated in mathematical terms: I will, however, limit myself to an informal outline of the issues involved and invite the reader interested in the formal issues to consult Gazdar (1987). The second is a substantive matter and concerns the nature of the linguistic principles that constrain the 'appropriate grammatical description' mentioned above. Since linguistic principles tend to vary from theory to theory, and indeed can change over time within one theory, it is perhaps hardly surprising that the establishment of the 'correct' grammar can be a matter of controversy.

To put some flesh on these observations, consider a simple example involving the analysis of a

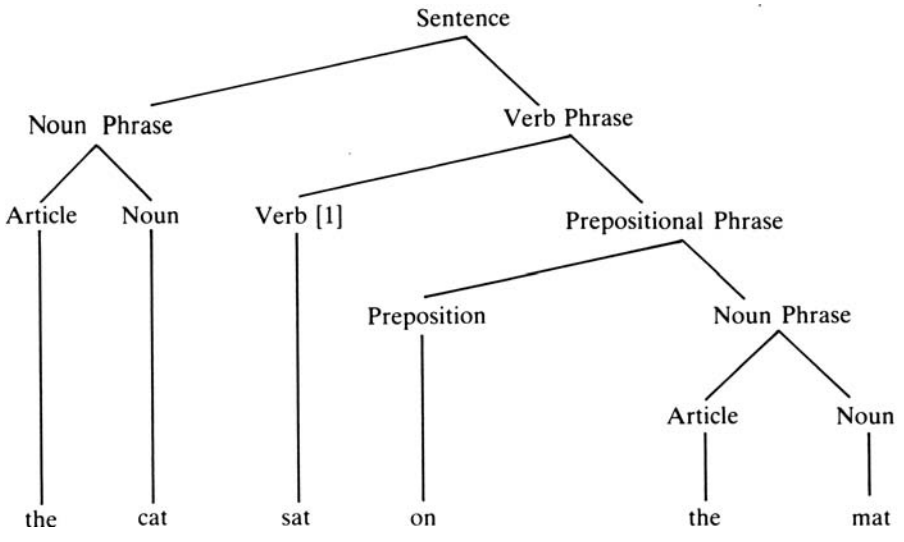

Figure 1

single sentence: *The cat sat on the mat.* We will make the simplifying assumption that words are the smallest unit that a grammar deals with, so, for example, although it is obvious that *sat*, as the past tense form of the verb SIT, is capable of further analysis, we will treat it as a unit of analysis. A more detailed account would need to discuss the grammar of the word. Given this simplification, the analysis shown in Figure 1 is largely uncontroversial, and we will suppose that this deliberately minimal account is the appropriate grammatical description mentioned above.

The analysis identifies the words as the smallest relevant units, and displays information about their **lexical categorisation** (*the* is an article, *mat* is a noun, etc.). It also shows the **constituent structure** of the sentence, what are and what are not held to be proper sub-parts of the sentence, and assigns each constituent recognised to a particular **category** (*the cat* is a noun phrase, *on the mat* is a prepositional phrase, and so on). Implicitly it also denies categorial status to other possible groupings of words; *sat on*, for example, is not a constituent at all.

A simple grammar that will generate this sentence, and its grammatical description is shown in Table 1.

Simple though this grammar is, it is formulated in accordance with some general principles. The most general of these is that a grammar consists of a number of distinct components. In this case there are two: a **syntax**, which defines permissible constituent structures; and a lexicon, which lists the words in the language and the lexical class to which each belongs. The syntax rules are themselves constrained along the following lines:

1. All rules are of the form A → BC.
2. '→' is to be interpreted as 'has the constituents'.
3. A rule may contain only one category on the left-hand side of →.
4. A rule may contain one or more categories (including further instances of the initial symbol 'S') on the right-hand side of →.

Table 1

Syntax		
S →	NP	VP
NP →	Art	N
VP →	V[l]	PP
PP →	Prep	NP

Lexicon	
cat	N
mat	N
on	Prep
sat	V[l]
the	Art

5. Categories introduced on the right-hand side of → are ordered with respect to each other.
6. 'S' is the **initial symbol**; i.e. the derivation of any sentence must start with this symbol.
7. When the left-hand side of a rule is a phrasal category, the right-hand side of the rule must contain the corresponding lexical category, e.g., an NP must have an N as one of its constituents (and may have other categories – Art, say).
8. The lexical categories N, V, P, Art, etc. are the **terminal vocabulary**; i.e. these symbols terminate a derivation and cannot themselves be further developed in the syntax.
9. The lexical categories may be augmented to indicate the membership of some subclass of the category; e.g., in the example above, the category V is differentiated into V[l] (*lay*, *sat*), to distinguish it from V[2], V[3], etc. (to which we will come).
10. The lexicon must be formulated in such a way that each word is assigned to one of the permissible lexical categories listed in 8.

The grammar can be easily extended. We could extend the lexicon:

a	Art
dog	N
under	Prep
lay	V[1]

We can add more rules to the syntax. For instance, *sat* and *lay* require to be followed by a PP – *The cat lay under the table* – but cannot be directly followed by an NP (**The cat lay the mouse*) or by a sentence (**The cat lay that the man chased the mouse*). They are characterised as V[1], i.e. verbs of subclass 1. By contrast, a verb like *caught* requires a following NP: *The cat caught the mouse* but not **the cat caught under the table* or **the cat caught that the mouse lay under the table*. We will characterise these as V[2]. The verb *said* is different again: it requires a following sentence: *The man said that the cat caught the mouse* but not either **the man said the cat* or **the boy said under the table*. We will label it as a member of V[3]. To accommodate these different grammatical subclasses of verb, we can add the following rules:

VP → V[2] NP
VP → V[3] S

This will entail additional vocabulary:

caught	V[2]
chased	V[2]
said	V[3]
thought	V[3]

This slightly enlarged grammar is capable of generating large numbers of sentences. It is true that they will exhibit a boringly limited range of syntactic structures and the difference between them will largely be lexical, but they will nevertheless be different. And with a modest number of additional rules of syntax and a few more lexical items, the number of distinct sentences the grammar will be capable of generating will become very substantial. Indeed, since the grammar contains the recursive rule VP → V[3] S, the formal power of the grammar is infinite.

This being the case, two things follow. The first is that the notion of **generative** must be understood to relate to the abstract capacity of the grammar to recognise a sentence as a member of the set of sentences it generates, rather than to a capacity to physically produce any particular sentence, or indeed physically recognise some particular sentence as a member of the set of sentences it can generate. The second is that the grammar is in itself neutral as to production and recognition. A mathematical analogy is appropriate. Suppose we had a rule to generate even numbers. It should be clear that in a literal sense the rule could not actually produce all the even numbers: since there are infinitely many of them, the task would be never-ending. It could, however, be the basis of an algorithm that could be used to produce an arbitrary even number as an example, or to check whether an arbitrary number is or is not an even number. In a comparable fashion we can construct an algorithm that will use a generative grammar in the construction of sentences together with their analyses, or the analysis of a particular sentence to see if it belongs to the set of sentences generated by the grammar. There are many ways of performing either task, so the set of rules which follow are merely exemplificatory. To produce sentences and assign them analyses of the kind shown in Figure 1, we could construct a **sentence generator** along the following lines:

1. Start with the initial symbol S.
2. Until all the category symbols are members of the terminal vocabulary (i.e. the lexical category symbols), repeat: for any category symbol that is not a member of the terminal vocabulary, select a rule from the syntax which has this symbol as the left-hand constituent and develop whatever structure the rule specifies.
3. Develop each lexical category symbol with a word from the lexicon of the relevant category.
4. Stop when all the items are words.

To check whether a sentence is generated by the grammar and offer an analysis, we could construct a parser along these lines:

1. Identify the lexical category of each word.
2. Repeat: for any category symbol or sequence of category symbols select a rule of the grammar in which these occur as the right-hand constituents of a rule and show them as constituents of the symbol on the left-hand side of the rule.
3. Stop when all the category symbols are constituents of S.

Let us now relate this simple account to the issues with which we began. With respect to the first issue, the productive capacity of a grammar, even the simple grammar illustrated can account for large numbers of sentences, particularly since it contains the **recursive** rule VP V[3] S, and the grammar can readily be extended. The second issue was concerned with the potential of an explicit rule system to derive the actual sentences of the language and to associate them with a grammatical description: given suitable generators and parsers, our rules can do this. The final issue is more contentious. Our grammar is indeed couched in terms of a set of principles of the sort that might be construed as universal principles of grammar design. Such principles can be formulated in mathematical terms. As to whether our grammar, as stated, also captures appropriate linguistic universals – this is clearly a matter that depends on what these are considered to be. The principles of constituent structure illustrated are not particularly controversial, but different theories may place other constraints.

E. K. B.

Suggestions for further reading

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Formal logic and modal logic

Introduction

Logic studies the structure of arguments and is primarily concerned with testing arguments for correctness or **validity**. An argument is **valid** if the premises cannot be true without the conclusion also being true: the conclusion **follows from** the premises. Since the time of Aristotle, validity has been studied by listing patterns or forms of argument all of whose instances are valid. Thus, the form:

Premise All	*A* is *B*.
Premise	*C* is *A*,
Conclusion	so *C* is *B*.

is manifested in distinct arguments such as:

All men are mortal.
Socrates is a man,
so Socrates is mortal.

All Frenchmen are Europeans.
De Gaulle was a Frenchman,
so de Gaulle was European.

A third example clarifies the notion of validity:

> All men are immortal.
> Socrates is a man,
> so Socrates is immortal.

Although the conclusion of this argument (*Socrates is immortal*) is false, the argument is valid: one of the premises (*All men are immortal*) is also false, but we can easily see that if both premises were true, the conclusion would have to be true as well.

There are good arguments which are not valid in this sense. Consider the argument:

> All of the crows I have observed so far have been black.
> I have no reason to think I have observed an unrepresentative sample of crows,
> so all crows are black.

Both of the premises of this argument could be true while the conclusion was false. Such **inductive** arguments are central to the growth of scientific knowledge of the world. But **formal logic** is not concerned with inductive arguments; it is concerned with **deductive** validity, with arguments which meet the stricter standard of correctness described above (see Skyrms 1975, for a survey of work in inductive logic).

Logically valid arguments are often described as **formally valid**: if an argument is valid, then any argument of the same form is valid. This means that logicians are not concerned with arguments that depend upon the meanings of particular descriptive terms, such as,

> Peter is a bachelor, so Peter is unmarried.

Rather, they are concerned solely with arguments that are valid in virtue of their logical or grammatical structure; they are concerned with features of structure that are signalled by the presence of so-called **logical words**: **connectives**, like *not*, *and*, *or*, *if … then …* ; **quantifiers** like *all*, *some*, and so on. We can represent the **logical form** of an argument by replacing all the expressions in it other than logical words and particles by variables, as in the example in the opening paragraph. The logical form of the example in the present paragraph can be expressed:

> a is *F*, so *a* is *G*'.

We see that the argument is not logically valid because it shares this form with the blatantly invalid:

> John is a husband, so John is a woman.

To explain why Peter's being unmarried follows from his being a bachelor, we must appeal to the meanings of particular non-logical words like *bachelor* and *married;* it cannot be explained solely by reference to the functioning of logical words.

I have described logic as concerned with the validity of arguments. It is sometimes described as concerned with a particular body of truths, the logical truths. These are statements whose truth depends solely upon the presence of logical words in them. For example,

> Either London is a city or it is not the case that London is a city.

This is claimed to be true by virtue of its logical form: any statement of the form

> Either *P* or it is not the case that *P*

is true and is an illustration of the **law of excluded middle**, i.e. there is no third intermediate possibility.

The two descriptions of logic are not in competition. Corresponding to any valid argument, there is a conditional statement, i.e. an 'if … then … ' statement, which is a logical truth. For example,

> If all men are mortal and Socrates is a man, then Socrates is mortal.

The Aristotelian approach to logic held sway until the late nineteenth century, when Gottlob Frege (1848–1925), Charles Peirce (1839–1914) and others developed new insights into the formal structure of arguments which illuminated complex inferences that had previously proved difficult to describe systematically. Philosophers normally hold that understanding a sentence requires at least some capacity to identify which of the arguments that the sentence can occur in are valid. Someone who did not see that *Socrates*

is mortal follows from the premises *Socrates is a man* and *All men are mortal* would put into question their understanding of those sentences. In that case, the formal structures revealed by logicians are relevant to the semantic analysis of language. It should be noted, however, that until recently many logicians have believed that natural languages were logically incoherent and have not viewed their work as a contribution to natural language semantics. The motivation for the revitalisation of logic just referred to was the search for foundations for mathematics rather than the understanding of natural language. I shall describe the most important systems of modern logic, which reflect the insights of Frege, Peirce, Bertrand Russell (1872–1970) and their followers.

Logicians study validity in a variety of ways and, unfortunately, use a wide variety of more or less equivalent notations. It is important to distinguish syntactic from semantic approaches. The former studies proof, claiming that an argument is valid if a standard kind of proof can be found which derives the conclusion from the premises. It describes rules of inference that may be used in these proofs and, sometimes, specifies axioms that may be introduced as additional premises in such proofs. This enables us to characterise an indefinite class of formally valid arguments through a finite list of rules and axioms. Semantic approaches to logic rest upon accounts of the truth conditions of sentences and the contributions that logical words make to them. An argument is shown to be valid when it is seen that it is not possible for the premises to be true while the conclusion is false [*see* FORMAL SEMANTICS]. Semantic approaches often involve looking for **counterexamples**: arguments of the same form as the argument under examination, which actually have true premises and a false conclusion (see, for example, Hodges 1977, which develops the system of **truth trees** or **semantic tableaux**, which provides rules for testing arguments in this way).

Propositional calculus

The logical properties of **negation**, **conjunction**, **disjunction** and **implication** are studied within the **propositional** or **sentential calculus**. These notions are formally represented by **connectives** or **operators**, expressions which form complex sentences out of other sentences. *And*, for example, forms the complex sentence,

Frege is a logician and Russell is a logician

out of the two shorter sentences *Frege is a logician* and *Russell is a logician*. Logicians often speak of those sentence parts which can themselves be assessed as true or false as sentences; hence, the displayed sentence 'contains' the simpler sentences *Frege is a logician* and *Russell is a logician*. Similarly, *It is not the case that …* forms a complex sentence out of one simpler one. If A and B represent places that can be taken by complete sentences, a typical notation for the propositional calculus is:

$\neg A$	It is not the case that A
$A \vee B$	A or B
$A \,\&\, B$	A and B
$A \rightarrow B$	If A then B

Complex sentences can be constructed in this way:

$(A \vee \neg B) \rightarrow$ $(C \,\&\, (B \rightarrow \neg D))$	If either A or it is not the case that B, then both C and if B then it is not the case that D.

The propositional calculus studies the logical properties of sentences built up using these logical notions.

Logicians treat these connectives as **truth functional**. We can evaluate utterances of indicative sentences by establishing whether what was said was **true** or **false**: these are the two **truth values** recognised by standard systems of logic. In the use of natural language, the truth value of a sentence can depend upon the context of its utterance: this is most evident in context-sensitive aspects of language like tense and the use of personal pronouns. Classical systems of logic abstract from this relativity to context and assume that they are dealing with sentences which have determinate truth values that do not vary with context. This allows logical laws to be formulated more simply and does not impede the evaluation of arguments in practice. Below, I shall indicate how logical systems can be enhanced to allow for context-sensitivity.

When a sentence is constructed from other sentences using such expressions, the truth value of the resulting sentence depends only upon the truth values of the sentences from which it is made. Thus, whatever the meaning of the sentence negated in a sentence of the form $\neg A$, the resulting sentence is true if the original sentence is false; and false if it is true. Similarly, a conjunction is true so long as each conjunct is true; and a disjunction is true so long as at least one disjunct is true. These relationships are expressed in **truth tables** (see Table 1). The two left-hand columns in Table 1 express the different possible combinations of truth values for A and B, and the other columns indicate the truth values the complex sentences have in those circumstances.

Systems of propositional calculus provide rules for the evaluation of arguments which reflect the meanings the logical words receive according to this interpretation. A straightforward method of evaluation is to compute the truth values the premises and the conclusion must have in each of the possible situations and then inspect the result to determine whether there are any situations in which the premises are true and the conclusion is false. This method can become cumbersome when complex arguments are considered, and other methods (such as truth trees) can be easier to apply.

The propositional calculus serves as a core for the more complex systems we shall consider: most arguments involve kinds of logical complexity which the propositional calculus does not reveal. Some claim that it is oversimple in other ways, too. They deny that logical words of natural languages are truth functional, or claim that to account for phenomena involving, for example, vagueness, we must admit that there are more than just two truth values, some statements having a third, intermediate, value between truth and falsity. Philosophers and logicians developed the notion of **implicature** partly to defend the logician's account of these logical words. They claim that phenomena which suggest that *and* or *not* are not truth functional reflect implicatures that attach to the expressions, rather than central logical properties [*see* PRAGMATICS]. However, many philosophers would agree that this is insufficient to rescue the truth-functional analysis of *if … then …* , with its implausible consequence that any indicative conditional sentence with a false antecedent is true. Such criticisms would not disturb those logicians who denied that they were contributing to natural-language semantics. They would hold it a virtue of their system that their pristine simplicity avoids the awkward complexities of natural languages and provides a precise notation for scientific and mathematical purposes.

Table 1 Truth tables

A	B	$\neg A$	$A \,\&\, B$	$A \vee B$	$A \rightarrow B$
t	t	f	t	t	t
t	f	f	f	t	f
f	t	t	f	t	t
f	f	t	f	f	t

Predicate calculus

Within the propositional calculus, we are concerned with arguments whose structure is laid bare by breaking sentences down into elements which are themselves complete sentences. Many arguments reflect aspects of logical structure which are not revealed through such analyses. The **predicate calculus** takes account of the logical significance of aspects of sub-sentential structure. It enables us to understand arguments whose validity turns on the significance of *some* and *all*, such as:

> John is brave.
> If someone is brave, then everyone is happy.
> So John is happy.

Aristotelian logic, mentioned above, described some of the logical properties of quantifiers like *some* and *all*. However, it was inadequate, largely because it did not apply straightforwardly to arguments that involve multiple quantification – sentences containing more than one interlocking quantifier. We need to understand why the following argument is valid, and also to see why the premise and conclusion differ in meaning:

> There is a logician who is admired by all philosophers.
> So, every philosopher admires some logician or other.

We shall now look at how sentences are analysed in the predicate calculus.

John is brave is composed of expressions of two sorts. *John* is a **name** or **singular term**, and *( ) is brave* is a **predicate**. The predicate contains a gap which is filled by a singular term to form the sentence. 'Wittgenstein admired Frege' is similarly composed of predicates and singular terms. However, *( ) admired ( )* is a **two-place** or **dyadic** predicate or **relational expression**: it has two gaps which must be filled in order to obtain a complete sentence. There are also triadic predicates, such as *( ) gives ( ) to ( )*, and there may even be expressions with more than three places, though as Hurford (2007: 95) points out, these tend to be 'linguistically strained'. Hurford cites Carnap's example (1937: 13), 'the temperature at the position o is as much higher than at the position 8 as the temperature at the position 4 is higher than at the position 3'. Following Frege, predicates are referred to as 'incomplete expressions', because they contain gaps that must be filled before a complete sentence is obtained. Predicates are normally represented by capital letters, and the names that complete them are often written after them, normally using lower case letters. Thus, the examples in this paragraph could be written:

Bj.
Awf (or wAf).
Gabc.
Habcd.

Combining this notation with that of the propositional calculus, we can symbolise 'If Wittgenstein is a philosopher then Wittgenstein admires Frege' thus:

Pw → wAf.

We can introduce the logical behaviour of quantifiers by noticing that the sentence, 'All philosophers admire Frege' can receive a rather clumsy paraphrase, 'Everything is such that if it is a philosopher then it admires Frege'.

Similarly, 'Someone is brave' can be paraphrased, 'Something is such that it is brave'.

In order to regiment such sentences, we must use the **variables** *x*, *y*, etc., to express the pronoun *it*, as well as the **constants** that we have already introduced.

Everything is such that (P*x* → A*x*f)
Something is such that (B*x*)

The relation between these variables and the quantifiers is made explicit when we regiment *Everything is such that* by '∀*x*'; and *Something is such that* by '∃*x*':

∀*x* (P*x* → A*x*f)
∃*x* (B*x*)

'∀' is called the **universal quantifier**, '∃' the **existential quantifier**. Our sample argument can then be expressed:

∃*x* (L*x* & ∀*y* (P*y* → A*yx*)).
so ∀*y* (P*y* →∃*x* (L*x* & A*yx*)).

The different variables 'keep track' of which quantifier 'binds' the variables in question. Compare the two sentences:

Someone loves everyone.
Everyone is loved by someone.

These appear to have different meanings – although some readers may perceive an ambiguity in the first. The notation of the predicate calculus helps us to see that the difference in question is a **scope distinction**. The former is naturally expressed:

∃*x*∀*y* (*x*L*y*).

and the latter as:

∀*y*∃*x* (*x*L*y*).

In the first case it is asserted that some individual has the property of loving everyone: the universal quantifier falls within the scope of the existential quantifier. In the second case, it is asserted that every individual has the property of being loved by at least one person – there is no suggestion, in this case, that it is the same person who loves every individual. The universal quantifier has **wide scope**, and the existential quantifier has **narrow scope**. The second statement

follows logically from the first. But the first does not follow logically from the second.

> Some car in the car park is not green.
> It is not the case that some car in the car park is green.

reflects the scope difference between:

$\exists x\,((\mathrm{C}x\ \&\ \mathrm{P}x)\ \&\ \neg \mathrm{G}x)$
$\neg\exists x\,((\mathrm{C}x\ \&\ \mathrm{P}x)\ \&\ \mathrm{G}x)$

The former asserts that the car park contains at least one non-green car; the second asserts simply that it does not contain any green cars. If the car park is empty, the first is false and the second is true. In the first sentence, the negation sign falls within the scope of the quantifier; in the second case, the scope relation is reversed.

Tense logic and modal logic

While the logic I have described above may be adequate for expressing the statements of mathematics and (a controversial claim) natural science, many of the statements of natural language have greater logical complexity. There are many extensions of this logical system that attempt to account for the validity of a wider range of arguments. Tense logic studies arguments which involve tensed statements. In order to simplify a highly complex subject, I shall discuss only propositional tense logic, which results from introducing tense into the propositional calculus. This is normally done by adding tense operators to the list of logical connectives. Syntactically, 'It was the case that' and 'It will be the case that' ('P' and 'F') are of the same category as negation. The following are well-formed expressions of tense logic:

> P*A*. It was the case that *A*.
> ¬F*A*. It is not the case that it will be the case that it was the case that *A*.

These operators are not truth functional: the present truth value of a sentence occupying the place marked by *A* tells us nothing about the truth value of either P*A* or F*A*. However, a number of fundamental logical principles of tense logic can be formulated which govern our tensed reasoning. For example, if a statement *A* is true, it follows that:

> P*A*.
> F*A*.

Moreover, if it will be the case that it will be the case that *A*, then it will be the case that *A:*

$\mathrm{FF}A \rightarrow \mathrm{F}A.$

More complex examples can be found, too. If:

> P*A* & P*B*.

it follows that:

$(\mathrm{P}(A\ \&\ B)) \vee (\mathrm{P}(\mathrm{P}A\ \&\ B)) \vee (\mathrm{P}(A\ \&\ \mathrm{P}B))$

There is a variety of systems of tense logic, which offers interesting insights into the interplay of tense and quantification, and which augments these tense operators by studying the complex logical behaviour of temporal indexicals like *now* (see McCarthur 1976: chapters 1 and 2).

Modal logic was the first extension of classical logic to be developed, initially through the work of C.I. Lewis (see Lewis 1918). Like tense logic, it adds non-truth-functional operators to the simpler logical systems; in modal logic, these operators express the concepts of possibility and necessity. The concept of possibility is involved in assertions such as:

> It is possible that it will rain tomorrow.
> It might rain tomorrow.
> It could rain tomorrow.

Necessity is involved in claims like:

> Necessarily bachelors are unmarried.
> A vixen must be a fox.

Other expressions express these modal notions too.

Just as tense logic formalises temporal talk by introducing tense operators, so modal logic employs two operators, 'L' and 'M', which correspond to *It is necessarily the case that* and *It is possibly the case that*, respectively. The sentences displayed above would be understood as having the forms 'M*A*' and 'L*A*', respectively. There is

an enormous variety of systems of modal logic, and rather little consensus about which of them capture the logical behaviour of modal terms from ordinary English. Some of the problems concern the interplay of modal operators and quantifiers. Others arise out of kinds of sentences which are very rarely encountered in ordinary conversation – those which involve several modal operators, some falling within the scope of others. To take a simple example: if 'L' is a sentential operator like negation, then it seems that a sentence of the form 'LLL*A*' must be well formed. However, we have very few intuitions about the logical behaviour of sentences which assert that it is necessarily the case that it is necessarily the case that it is necessarily the case that vixens are foxes. Only philosophers concerned about the metaphysics of modality are likely to be interested in whether such statements are true and in what can be inferred from them.

Some principles of inference involving modal notions are uncontroversial. Logicians in general accept as valid the following inference patterns:

L*A*, so *A*.

For example: vixens are necessarily foxes, so vixens are foxes. If something is necessarily true then, *a fortiori*, it is true.

A, so M*A*.

For example, if it is true that it will rain tomorrow, then it is true that it might rain tomorrow; if today is Wednesday, then today might be Wednesday. In general, whatever is actually the case is possible. Moreover, there is little dispute that necessity and possibility are interdefinable. 'It is necessarily the case that *A*' means the same as 'It is not possible that it is not the case that *A*'; and 'It is possible that *A*' means the same as 'It is not necessarily the case that it is not the case that *A*'. Once one tries to move beyond these uncontroversial logical principles, however, the position is much more complex. There is a large number of distinct systems of modal logic, all of which have received close study by logicians. There is still controversy over which of these correctly capture the inferential properties of sentences about possibility and necessity expressed in English.

The extensions of the standard systems of logic are not exhausted by those alluded to here. **Deontic logic** is the logic of obligation and permission: it studies the logical behaviour of sentences involving words like *ought* and *may*. There is also a large body of work on the logic of subjective or counterfactual conditionals. Consider a claim such as 'If the door had been locked, the house would not have been burgled.' Although this is of a conditional form, the conditional in question is plainly not truth functional. If we substitute for the **antecedent** (the first clause in the conditional) another sentence with the same truth value, this can make a difference to the truth value of the whole sentence. For example, 'If the window had been left open, the house would not have been burgled.'

Like the statements studied in modal logic, such statements appear to be concerned with other possibilities. The first claim is concerned with what would have been the case had the possibility of our locking the door actually been realised (see Lewis 1973).

Progress in both modal logic and the logic of these subjunctive conditionals has resulted in the development of **possible-world semantics** by Saul Kripke and a number of other logicians (see, for example, Kripke 1963). This work has led many philosophers and linguists to find in the work of formal logicians materials which can reveal the semantic structures of the sentences of a natural language [*see also* FORMAL SEMANTICS].

C. H.

Suggestions for further reading

There are many introductory logic text books; the following illustrate contrasting approaches:

Guttenplan, S. (1997) *The Languages of Logic*, Oxford: Blackwell.

Hodges, W. (1977) *Logic*, Harmondsworth: Penguin.

Useful introductions to tense logic and modal logic are:

Chellas, B. (1980) *Modal Logic*, Cambridge: Cambridge University Press.

McCarthur, R. (1976) *Tense Logic*, Dordrecht: Reidel.

McCawley, J.D. (1981) *Everything That Linguists Have Always Wanted to Know About Logic … But Were Ashamed to Ask*, Oxford: Basil Blackwell.

Formal semantics

Introduction

Inspired by the work of Alfred Tarski (1901–83) during the 1920s and 1930s, logicians have developed sophisticated semantic treatments of a wide variety of systems of formal logic [*see* FORMAL LOGIC AND MODAL LOGIC]. Since the 1960s, as these semantic treatments have been extended to tense logic, modal logic and a variety of other systems simulating more of the expressions employed in a natural language, many linguists and philosophers have seen the prospect of a systematic treatment of the semantics of natural languages. Richard Montague, David Lewis, Max Cresswell, Donald Davidson and others have attempted to use these techniques to develop semantic theories for natural languages.

Underlying this work is the idea that the meanings of sentences are linked to their **truth conditions**; we understand a sentence when we know what would have to be the case for it to be true, and a semantic theory elaborates this knowledge. Moreover, the truth conditions of sentences are grounded in referential properties of the parts of those sentences in systematic ways. Tarski's contribution was to make use of techniques from set theory in order to state what the primitive expressions of a language refer to, and in order to display the dependence of the truth conditions of the sentence as a whole upon these relations of reference.

Throughout, 'true' is understood as a metalinguistic predicate. In general, the **object language** is the language under study; for example, our object language is English if we study the semantics of sentences of English. The **metalanguage** is the language we use to talk about the object language. 'True' belongs to the language we use in making our study, i.e. the metalanguage. Moreover, the primitive notion of **truth** is assumed to be **language-relative**, as in:

> 'Snow is white' is a true sentence of English.
> 'La neige est blanche' is a true sentence of French.

We shall use **TL** to stand for the predicate ' … is a true sentence of L'. The task is to construct a theory which enables us to specify the circumstances under which individual sentences of a given language are true. It will yield theorems of the form:

> *S* is TL if, and only if, *p*.

For example,

> 'La neige est blanche' is True(French) if, and only if, snow is white.

The interest of the theory lies in the way in which it derives these statements of truth conditions from claims about the semantic properties of the parts of sentences and about the semantic significance of the ways in which sentence parts are combined into grammatical wholes.

There are alternative approaches to the task of constructing such a semantic theory, and there is no space here to consider all of the controversies that arise. In the space available, I shall develop a semantic theory for a formal language which mirrors some of the logical complexities of a natural language. The language will contain the connectives and quantifiers employed in the predicate calculus and also include some tense operators and modal operators [*see* FORMAL LOGIC AND MODAL LOGIC].

A simple language

First we consider a language L1, which contains no quantifiers, tense operators or modal operators. It contains three names, 'a', 'b' and 'c'; three **monadic** (one-place) predicates, 'F', 'G' and 'H', and the **dyadic** (two-place) relational expression 'R' [*see* FORMAL LOGIC AND MODAL LOGIC]. It also contains the standard logical connectives of propositional logic: '&', '¬', '∨' and '→'.

The grammatical sentences of this language thus include the following: Fa, Hb, Ga, Gc, Rab, Gb & Rbb, Ha ∨ (Ha & ¬Rbc).

We need to specify the truth conditions of all of these sentences together with the others that can be formulated within L1.

We first specify the **referents** of the names; that is, we say who the bearers of the names are – which objects in the world the names stand for:

(1a) ref(a) = Caesar
ref(b) = Brutus
ref(c) = Cassius

We then specify the **extensions** of the predicate expressions; that is, we say what property qualifies an object for having the predicate ascribed to it:

(1b) ext(F) = {*x*: *x* is a Roman}
ext(G) = {*x*: *x* is a Greek}
ext(H) = {*x*: *x* is an emperor}
ext(R) = {<*x*, *y*>: *x* killed *y*}

We then state (where ∈ indicates the relation of set membership):

(2) If a sentence is of the form, *Pn*, then it is TL if, and only if, ref(*n*) ∈ ext(*P*).
If a sentence is of the form *Rnm*, then it is TL if and only if { < ref(*n*), ref(*m*) → ∈ → ext(*R*).

It is easy to see that the following specifications of truth conditions follow from these statements:

Fa is TL1 if, and only if, Caesar is a Roman.
Rbc is TL1 if, and only if Brutus killed Cassius.

and so on. We have constructed an elementary semantic theory for part of our elementary language.

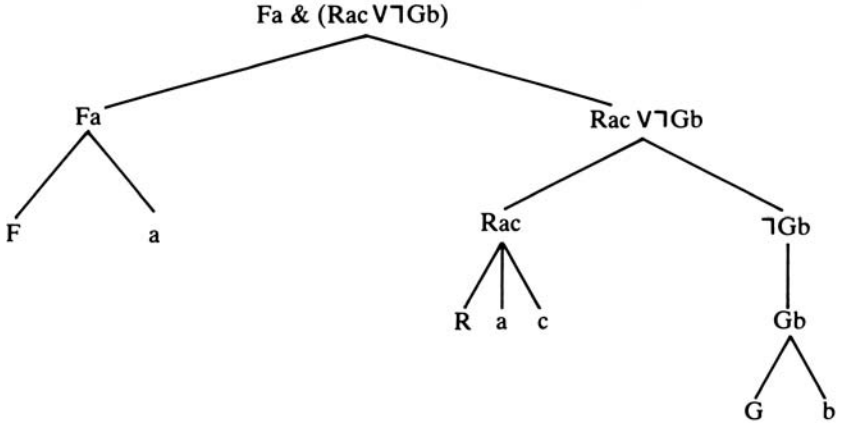
It is easy to extend this to include sentential connectives:

(3) A sentence of the form *A*&*B* is TL_1 if, and only if, *A* is TL_1 and *B* is TL_1.
A sentence of the form ¬ *A* is TL_1 if, and only if, *A* is not TL_1.

and so on. Relying upon such axioms, we can derive a statement of the TL_1 conditions of any sentence of our simple language.

The conditions listed under (1) specify semantic properties of sub-sentential expressions: names and predicates. Those under (2) explain the truth conditions of the simplest sentences in terms of the semantic properties of these sub-sentential expressions. Finally, those in (3) concern the semantic roles of expressions which are used to construct complex sentences out of these simple ones. I mentioned that L_1 was a rather simple language, and we can now notice an important aspect of this simplicity. Consider the sentence 'Fa & (Rac v Gb)'. We can represent the way in which this sentence is built out of its elements with a tree diagram (Figure 1).

The conditions in (1) state the semantic properties of expressions in the bottom nodes of the tree: those in (2) concern how the truth conditions of the next higher nodes are determined by these bottom semantic properties. All the higher nodes are explained by the conditions in (3). It is a feature of this language that, apart from the subsentential expressions at the bottom level, every expression of the tree has a **truth value**.



It is true or false, and this is exploited in the conditions for explaining the truth conditions for complex sentences. We must now turn to a language which does not share this feature.

Quantifiers

L_2 is obtained from L_1 by adding universal and existential quantifiers ('∀' and '∃') together with a stock of individual variables, '*x*', '*y*', '*z*', etc., as in formal logic [*see* FORMAL LOGIC AND MODAL LOGIC]. The grammatical sentences of L_2 include all the grammatical sentences of L_1 together with such expressions as:

$\exists x \mathrm{F}x$, $\exists x \forall y\ \mathrm{R}xy$, $\forall z(\mathrm{H}z \ \&\ \exists x\ \mathrm{R}zx)$.

The tree diagram in Figure 2 displays the structure of the last of these. Such sentences are less straightforward than those discussed above. First, it is unclear what the semantic properties of variables are: they do not refer to specific objects, as names do. Second, the expressions '$\mathrm{H}z$', '$\mathrm{R}zx$' $\exists x\ \mathrm{R}zx$' and '$\mathrm{H}z \ \&\ \exists x\ \mathrm{R}zx$' contain **free variables**, variables which are not bound by quantifiers. It is hard to see how such expressions can be understood as having definite truth values. If that is the case, then we need a different vocabulary for explaining the semantic properties of some of the intermediate expressions in the tree.

Furthermore, if these expressions do lack truth values, the condition we specified for '&', which was cast in terms of 'truth', cannot be correct:

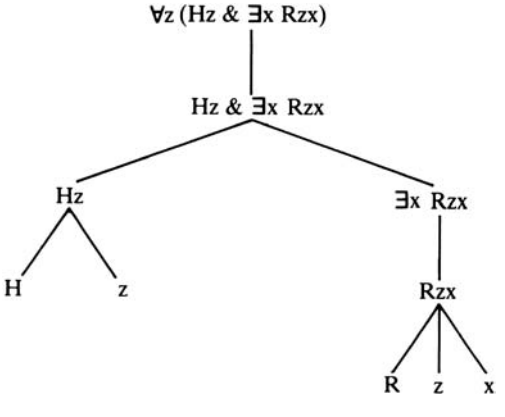


Figure 2

'$\mathrm{H}z \ \&\ \exists x\ \mathrm{R}zx$' is built out of such expressions and, indeed, is one itself.

First, we can specify a set D: this is the **domain** or **universe of discourse** – it contains everything that we are talking about when we use the language. The intuitive approach to quantification is clear. '$\exists x\mathrm{F}x$' is a true sentence of L_2 if at least one object in D belongs to the extension of 'F'; '$\exists x\ \exists y\ \mathrm{R}xy$' is true so long as at least one pair of objects in D belongs to the extension of 'R'; '$\forall x\ \mathrm{G}x$' is true if every object in D belongs to the extension of 'G'. The difficulties in the way of developing this idea emerge when we try to explain the truth conditions of sentences which involve more than one quantifier, such as '$\exists x\ \forall y\ \mathrm{R}xy$', and those which contain connectives occurring within the scope of quantifiers, like '$\forall z\ (\mathrm{H}z \ \&\ \exists x\ \mathrm{R}xz)$'. The following is just one way to meet these difficulties. The strategy is to abandon the task of specifying truth conditions for sentences *directly*. Rather, we introduce a more primitive semantic notion of **satisfaction**, and then we define 'truth' in terms of satisfaction.

The problems to be faced here are largely technical, and it is not possible to go into the mathematical details here. However, it is possible to introduce some of the underlying concepts involved. Although variables do not refer to things as names or demonstrative expressions do, we can always (quite arbitrarily) allocate objects from the universe of discourse to the different variables. We shall call the result of doing this an **assignment** – it assigns values to all of the variables. It is evident that many different assignments could be constructed allocating different objects to the variables employed in the language.

We say that one of these assignments **satisfies** an open sentence if we should obtain a true sentence were we to replace the variables by names of the objects that the assignment allocates to them. For example, consider the open sentence '*x* is a city.' An assignment which allocated London to the variable '*x*' would satisfy this open sentence, since *London is a city* is true. However, an assignment which allocated Brutus or the moon to this variable would not satisfy it. This close connection between satisfaction and truth should make it clear that an assignment will satisfy a **disjunctive** (*or*) sentence only if it

satisfies at least one of the **disjuncts** (clauses held together by *or*). It will satisfy a **conjunctive** (*and*) sentence only if it satisfies both of the **conjuncts** (clauses held together by *and*).

We can then reformulate our statement of the truth conditions of simple quantified sentences. The existentially quantified sentence '$\exists x$ Fx' is true so long as at least one assignment satisfies the open sentence 'Fx'. If there is an assignment which allocates London to x, then at least one assignment satisfies 'x is a city'; so 'Something is a city' is true. In similar vein, '$\forall x$ Fx' is true if every assignment satisfies 'Fx'. So far, this simply appears to be a complicated restatement of the truth conditions for quantified sentences described above. The importance of the approach through satisfaction, as well as the mathematical complexity, emerges when we turn to sentences involving more than one quantifier. Consider the sentence *Someone admires all logicians*. Its logical form can be expressed:

$$\exists x \, \forall y \, (\mathrm{L}y \rightarrow x\mathrm{A}y).$$

Under what circumstances would that be true?

As a first step, we can see that it is true so long as at least one assignment satisfies the open sentence:

$$\forall y \, (\mathrm{L}y \rightarrow x\mathrm{A}y).$$

But when does an assignment satisfy an open sentence containing a universal quantifier? We cannot say that every assignment must satisfy '$\mathrm{L}y \rightarrow x\mathrm{A}y$': that will be true only if *everybody* admires every logician, and so does not capture the truth conditions of the sentence that interests us. Rather, we have to say that an assignment satisfies our universally quantified open sentence so long as every assignment that agrees with it in what it allocates to 'x' satisfies '$\mathrm{L}y \rightarrow x\mathrm{A}y$'. Our sentence is true so long as a large number of assignments satisfy '$\mathrm{L}y \rightarrow x\mathrm{A}y$' which have the following properties:

1. Each one allocates the same object to 'x'.
2. Every member of the universe of discourse is assigned to 'y' by at least one of them.

This provides only an illustration of the use that is made of the concept of satisfaction in formal semantics. More complete, and more rigorous, treatments can be found in the works referred to in the suggestions for further reading. It illustrates how truth-conditional semantics can be extended beyond the fragment of a language where all of the sub-sentential expressions occurring in sentences have either truth values, references or extensions.

Tense and modality

I shall now briefly indicate how the semantic apparatus is extended to apply to $\mathrm{L}_2\mathrm{T}$ and $\mathrm{L}_2\mathrm{TM}$: these are L_2 supplemented with tense operators and modal operators, respectively [*see* FORMAL LOGIC AND MODAL LOGIC]. $\mathrm{L}_2\mathrm{T}$ contains the tense operators 'P' (*it was the case that* …) and 'F' (*it will be the case that* …). $\mathrm{L}_2\mathrm{M}$ contains the modal operators 'L' (*necessarily*) and 'M' (*possibly*). In order to avoid forbidding complexity, we shall ignore problems that arise when we combine tense or modality with quantification. This means that we shall be able to consider the truth conditions of sentences without explaining these in terms of conditions of satisfaction.

Tensed language introduces the possibility that what is true when uttered at one time may be false when uttered at other times. Hence the truth predicate we need in our metalanguage if we are to describe the truth conditions of tensed sentences involves the idea of a sentence being true at a time:

> 'It is raining' is a true sentence of English at noon on 1 January 1991.

Similarly, we shall talk of expressions being satisfied by assignments at certain times and not at others. We can introduce a set T of moments: we order the members of T using the relational expression '<': '$t_1 < t_2$' means that t_1 (a member of T) is earlier than t_2. Unless time is in some way circular, this relation will be transitive, asymmetric and irreflexive.

We shall also have to introduce more complexity into our extensions for predicates and relations. A car may be red at one time, and then be painted blue, so it does not unequivocally belong to the extension of 'red'. The extension of 'red' will be a set of ordered pairs, each pair consisting of an object and a time: < a,

t_3> will belong to the extension of 'red' if object *a* was red at time t_3. (Alternatively, we could retain a set of objects as the extension of 'red' and insist that a predicate will have a different extension at different times.) Similarly, the extension of the relation 'loves' will be a set of ordered triples, comprising two individuals and a time such that the first individual loved the second individual at that time.

The idea behind the semantics for tense is straightforward. 'P*A*' is true at a time if '*A*' is true at some earlier time: 'F*A*' is true at a time if '*A*' is true at a later time. More formally:

> 'P*A*' is true at t_n if, and only if, $\exists t_m$ ($t_m < t_n$ & '*A*' is true at t_m)
> 'F*A*' is true at t_n if, and only if, $\exists t_m$ ($t_n < t_m$ & '*A*' is true at t_m)

On this basis, we can account for the truth conditions of complex tensed sentences, especially when quantification is introduced.

The semantics for modality is analogous to that for tense. We can all conceive that the world might have been very different from the way it actually is: there are countless 'ways the world could have been'. Many sentences will have different truth values in these different **possible worlds**. Just as we have seen that the truth value of a sentence can vary from time to time, so it can vary from possible world to possible world. We make use of a set W of possible worlds, whose members, w_1, w_2, … w_n, … , include the actual world together with many others that are 'merely' possible. Just as tensed discourse led us to recognise that we should only talk of the truth value of a sentence at a time, so modal discourse leads us to relativise truth to a world:

> *S* is a true sentence of L at *t* in *w*.

The intuitive idea is again straightforward. 'M*A*' is true in a world *w* if '*A*' is true in at least one possible world, but not necessarily *w* itself. Once again we may have to adjust the semantic values of predicates: the extension of 'red' is extended into a set of ordered triples, which will serve as its **intension**. Each triple will consist in an object, a time and a world. < *o*, t_n, w_n < belongs to the extension of 'red' if object *o* is red at time t_n in world w_n. Statements of truth conditions are again relativised:

> 'F*a*' is true at t_n in w_n if, and only if, <ref (*a*), t_n, w_n < belongs to the extension of 'F'.
> '*LA*' is true at t_n in w_n if, and only if, '*A*' is true at t_n in every world. etc.

There is a large number of systems of modal logic and tense logic that have been described and studied in the literature. For example, systems of tense logic vary according to their conception of the members of the set of moments T, and of the relation between moments '<'. Thus, there are systems which describe the structure of discrete time and others which assume that time is densely ordered; other systems allow for circular time or for the possibility that time branches. Modal logicians usually define a relation on the class of worlds which is analogous to '<'. This is often called an **accessibility relation** or an **alternativeness relation**. If we express this relation 'R', then the truth conditions of sentences involving modal operators are expressed:

> 'L*A*' is true at t_n in w_n if, and only if, A is true at t_n in every world w_m such that w_nRw_m,
> 'M*A*' is true at t_n in w_n if, and only if, there is a world w_m such that w_nRw_m, and '*A*' is true in w_m.

This relation has no natural expression corresponding to the reading of '<' as 'earlier than'. However, examination of the structure of the class of a world in this way has yielded insights into the understanding of sentences involving several iterated modal operators. Chellas (1980) or Hughes and Cresswell (1968) provide detailed introductions to the use of these techniques in studying the semantics of modal logics.

Many logicians have been occupied with extending this framework to account for a much larger fragment of English. The literature contains explorations of the semantics of adjectives and adverbs, the semantics of **subjunctive conditionals**, words like *ought* and *may*, and sentences involving mental-state words such as *believes* and *desires*.

C. H.

Suggestions for further reading

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Dowty, D.R., Wall, R.E. and Peters, S. (1981) *Introduction to Montague Semantics*, Dordrecht: Reidel.

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Functional phonology

By functional phonology is normally meant the phonological theory predominantly associated with the Russian, Nikolaj Sergeyevich Trubetzkoy (1890–1938). This theory is also known as **Prague School phonology**, and there exists a fair amount of literature on the subject. Much less has been written in English about the functional phonological theory developed by the Frenchman André Martinet (1908–99) and his associates. Both streams of functional phonology are founded on linguistic functionalism [*see* FUNCTIONALIST LINGUISTICS] and have much in common, but also significant divergences on some fundamental theoretical points. Incidentally, Martinet, though associated in his writings with the **Prague Linguistic Circle**, never attended the Circle's monthly meetings, nor was he a member of the Circle.

Functionalists study phonic elements from the points of view of the various functions they fulfil in a given language. They identify and order these functions hierarchically. Some of the better-known functions are the following:

- **The representative function**, whereby speakers inform listeners of whatever extralinguistic facts or states they are talking about. This corresponds to what the Austrian psychologist/linguist, Karl Bühler (1879–1963) – a member of the Prague Linguistic Circle – calls ***Darstellungsfunktion***.
- **The indexical** or **expressive function** (Bühler's **Kundgabefunktion** or **Ausdrucksfunktion**), whereby information is revealed to the listener about various aspects of the speaker. For example, British speakers who consistently use in their pronunciation of *mate*, *same*, *cake*, etc., a monophthongal vowel (e.g., [e:], which is very close to cardinal vowel no. 2 [*see* ARTICULATORY PHONETICS], instead of the corresponding diphthongal vowel ([ei]), thereby reveal that their geographical provenance is northern England or Scotland. A speaker of Chukchi of northeastern Asia who pronounces [ʧ] reveals himself as an adult male, while another Chukchi speaker who pronounces [ts] in its place shows herself/himself as an adult female or a child. The indexical function may further impart information about the speaker's socio-economic status, occupation, degrees of formal education, etc.
- **The appellative** or **conative function** (Bühler's **Appellfunktion**), which serves to provoke well-definable impressions or feelings in the listener. For example, an imperative tone in which a military order is given by a superior officer urges soldiers to undertake a certain action. Or, a specific intonation with which an utterance is made may have the effect of inducing the listener to carry out or not to carry out a certain act.
- **The distinctive function**. This is a function which derives directly from the concept of **opposition** and, in the case of phonological analysis, from the concept of **phonological opposition**. It is the function by virtue of which linguistic forms are opposed to, or differentiated from, each other. The minimal linguistic form that is meaningful, or the **minimal significant unit**, is known as a **moneme**, which consists in the association between a **signifier** (vocal expression) and a **signified** (semantic content). For example, in English, *bet* and *bit* are monemes whose signifiers and signified are, respectively, /bet/ and 'bet', and /bɪt/ and 'bit'. Two further examples of monemes are *spell* and *smell*, whose signifiers and signified are, respectively, /s p–b el/ (where /p–b/ is an archiphoneme – see below) and 'spell', and /smel/ and 'smell'. The members of the former pair are phonologically distinguished by virtue of the opposition between /e/ in *bet* and /ɪ/ in *bit*, and those of the latter pair by virtue of the opposition between /p–b/ and /m/. Conventionally, the letters

enclosed by two diagonal lines stand for sequentially minimal distinctive units which may be phonemes (e.g. /b/ above) or archiphonemes (e.g. /p–b/ above). We say that a phoneme or an archiphoneme fulfills the distinctive function. Similarly, in a tone language [see TONE LANGUAGES], each of the tones fulfills the distinctive function, so that, for example, /¯ma/ 'mother' and /´ma/ 'hemp' in Mandarin Chinese are phonologically differentiated from each other by virtue of the opposition between /¯/ (a high-level tone) and /´/ (a high rise from a mid-high level). Of course, a tone language also possesses phonemes and possibly archiphonemes as well, so that, for example, /¯ma/ and /¯ta/, 'it, he, she', are differentiated from each other by virtue of the opposition between /m/ and /t/, while /¯ʂ i-y/ 'teacher' and /¯ʂu/ 'book' are distinguished from each other by virtue of the opposition between /i-y/ and /u/. Note that a phoneme, an archiphoneme, a tone or an architone has no meaning. The distinctive function is an indispensable phonological function in any given language.

- The **contrastive function** (Martinet's ***fonction contrastive***, Trubetzkoy's ***kulminative Funktion***), which enables the listener to analyse a spoken chain into a series of significant units like monemes, words, phrases, etc. **Accent** (or stress) in a language functions contrastively by bringing into prominence one, and only one, syllable in what is called an **accentual unit**. Since an accentual unit is in many languages (e.g., Polish, Spanish, Russian, Italian) what is commonly referred to as a word, the listener automatically analyses a spoken chain into a series of words. However, in such a language as German, which allows cumulative compounding in word formation, a compound word may consist of a number of elements, each of which bears accent. To consider just one example, in the German word *Kleiderpflegeanstalt* 'valet service', each element (*Kleider-*, *-pflege-*, *-anstalt*) receives accent, but with a hierarchy in the strength of the accent, so that the accent in *Kleider-* is the strongest, that in *-anstalt* less strong, and that in *-pflege-* the least strong. What is meant by the term '**contrastive**' is that the accented (or stressed) syllable contrasts with (stands out in relation to) the unaccented syllable(s) and thus characterises the accentual unit as a whole.
- The **demarcative** or **delimitative function**, which is fulfilled in such a way that the boundary between significant units is indicated. For example, in German, the phoneme sequence /nm/ reveals a boundary as existing between /n/ and /m/, since in this language no word either begins or ends with /nm/. The word *unmöglich* is a case in point, *un* being one significant unit (here a moneme) and *möglich* another significant unit (here a combination of monemes). In Tamil, to consider another language, an aspirated voiceless plosive occurs in word-initial position only. Consider, for example, *talai* [t̪ʰ] 'head', *pontu* [-d̪-] 'hole', *katu* [-ð-] 'ear'. The three different sounds are all realisations of one and the same phoneme /t̪/. The occurrence of the aspirated voiceless plosive in this language therefore indicates the boundary between the word which begins with it and the preceding word. Another example of a phonic feature functioning demarcatively is a **fixed accent**, i.e. an accent whose place in the accentual unit is always fixed in relation to (as the case may be) the beginning or end of the accentual unit. A fixed accent functions not only contrastively but also demarcatively. Accent in Swahili always falls on the last but one syllable of the accentual unit which corresponds to a word, so that the occurrence of the accent shows that the following word begins with the second syllable after the accented syllable. Likewise, accent in Finnish, which is a fixed accent always falling on the initial syllable of the accentual unit that corresponds to a word, reveals that the word boundary occurs between the accented syllable and the preceding syllable. Of course, a **free accent** (i.e. one which is not fixed) can only function contrastively and not demarcatively as well.
- The **expressive function**, whereby speakers convey to listeners their state of mind (real or feigned) without resorting to the use of an additional moneme or monemes. For

example, speakers of English may say *That tree is eNNNormous*, overlengthening /n/ and employing an exaggerated high fall pitch over *-nor-*, instead of saying *That tree is absolutely enormous* or *That tree is tremendously enormous*, employing the additional monemes *absolute* and *ly*, or *tremendous* and *ly*. The specific suprasegmental phonic elements just mentioned fulfil the expressive function in that they indicate the speakers' admiration, surprise, etc., at the size of the tree in question. It should be noted in this connection that intonation [see INTONATION] preeminently fulfils the expressive function whereby pitch phenomena are exploited expressively, i.e. speakers express definiteness or lack of definiteness, certainty or uncertainty, etc. in their minds about what they predicate.

The above are some major functions of phonic elements (there are other, minor, ones) that are identified in various languages. They are all recognised as major functions, but it is possible to establish a hierarchy of functions in terms of their relative importance from a functional point of view. For example, Trubetzkoy (1939/1969: 28) says that the distinctive function is indispensable and far more important than the culminative and deliminative functions, which are expedient but dispensable; all functionalists agree with him on this point.

It has been pointed out (see above) that the distinctive function derives directly from the concept of phonological opposition and that the distinctive function is fulfilled by a phoneme, an archiphoneme, a tone or an architone. As mentioned above, the distinctive function is considered to be by far the most important function, and in what follows we shall be exclusively concerned with some aspects of functional phonology that are relevant to this function.

It is crucial to understand that, in functional phonology, the concept of phonological opposition is primary, while the concept of the phoneme is secondary; without a phonological opposition, phonemes are inconceivable and inadmissible; the concept of the phoneme derives its validity from the fact that phonemes are members of a phonological opposition. The concept of **phonological opposition** is thus at the centre of functional phonology.

A phoneme or an archiphoneme is a sum of **phonologically relevant features** – **relevant features**, for short – which themselves fulfil the distinctive function. (Relevant features should not be confused with distinctive features as employed in generative phonology [*see* GENERATIVE PHONOLOGY]). For example, the English monemes *bark* and *mark*, or *park* and *mark*, are distinguished from each other by virtue of the opposition between /b/ and /m/, or between /p/ and /m/. Furthermore, /b/ and /m/, or /p/ and /m/, are distinguished from each other because of the opposition between the relevant features 'non-nasal' and 'nasal'. An opposition between phonemes, between phonemes and archiphonemes, between archiphonemes, between relevant features, or between tones, between tones and architones, or between architones, is said to be a **phonological opposition**. The inventory of the **distinctive units** of a given language comprises the phonemes and, if any, archiphonemes, and the tones and architones, if any, as well, in the case of a tone language. A phoneme or an archiphoneme is realised by sounds, generally referred to as **variants** or **realisations**, each of which possesses the phonologically relevant phonic features that characterise the phoneme or the archiphoneme concerned, plus phonologically irrelevant features. The same is true of realisations of a tone, except that these are **pitches**. **Variants** too are identified in terms of their functions, so that the functionalist talks about, for example, **combinatory variants** (variants associated with specific phonetic contexts in which they occur), **individual variants** (variants endowed with the indexical function), **stylistic variants** (variants indicative of different styles of speech), etc. These variants are also hierarchically identified according to their different functions in the phonology of a given language.

The **phonemes** and the **archiphonemes** of a given language are identified at the same time as mutually different sums of relevant features in terms of which they are definable, by means of **the commutation test**. In order to perform the commutation test, the functionalist chooses from within a corpus of data a certain number of **commutative series** which are associated with different phonetic contexts and each of

which consists of a series of monemes, arranged in a parallel order, whose signifiers differ minimally from each other by the difference of a single segment at a corresponding point while the rest are identical. Note specifically that recourse to the so-called minimal pairs only is theoretically inadequate for the purpose of identifying the phonemes and the archiphonemes of a given language. The items of each commutative series may be termed **multiplets**, hence **minimal multiplets**.

Let us suppose that functionalists have at their disposal a corpus of English data. Let us also suppose that they have selected the following commutative series: commutative series 1, associated with the phonetic context [-ɪn], consisting of *pin*, *bin*, *tin*, *din*, *sin*, *zinn(ia)*, *fln*, *vin(cible)*, etc.; commutative series 2, associated with the phonetic context [mæ-], consisting of *map*, *Mab*, *mat*, *mad*, *mass*, *Maz(da)*, *maf(ia)*, *mav(erick)*, etc.; commutative series 3, associated with the phonetic context ['ʌ-ə], consisting of *upper*, *(r)ubber*, *utter*, *udder*, *(t)usser*, *(b)uzzer*, *(s)uffer*, *(c)over*, etc. More commutative series are of course available, but the three we have chosen will suffice to illustrate the commutation test here.

As functionalists go on to consider more and more different commutative series, a point of diminishing returns is reached fairly soon. In commutative series 1 above, we can see that [p] is differentiated from [b], [t], [d], [s], [z], [f], [v], etc., and that in commutative series 2, [p] is differentiated from [b], [t], [d], [s], [z], [f], [v], etc.: the phonetic differences between these segments are similarly minimal across the different commutative series. It will also be seen that, for example, [p] in commutative series 1 differs from [m] in the same series by the same phonetic difference that distinguishes [p] in commutative series 2 from [m] in that series, and furthermore, [p] in commutative series 3 from [m] in that series. The phonetic difference consists in the opposition between non-nasality (in [p]) and nasality (in [m]). Comparison between [p] and [t] in all three commutative series reveals bilabiality ascribable to [p] and apicality ascribable to [t].

Similarly, comparison between [p] and [b] in all three commutative series reveals voicelessness ascribable to [p] and voicedness ascribable to [b]. The latter phonetic difference needs some clarification, which will be provided below when the internal structure of a relevant feature is explained.

On the basis of this commutation test, functionalists identify, among other relevant features, the relevant features 'non-nasal', 'bilabial' and 'voiceless', the sum of which constitutes the phoneme /p/. Similarly, the sum of 'non-nasal', 'bilabial' and 'voiced' constitutes the phoneme /b/; the sum of 'non-nasal', 'apical' and 'voiceless' constitutes the phoneme /t/; the sum of 'non-nasal', 'apical' and 'voiced' constitutes the phoneme /d/; and so on. What have been referred to above as [p]s in the different commutative series are realisations of one and the same phoneme, /p/. Likewise, other segments are realisations of other given phonemes.

If functionalists identify [b]s (correctly, [b̥]s, i. e. devoiced) in commutative series 1 and 2 as realisations of the same phoneme (/b/) whose realisation is [b] (voiced) in commutative series 3, rather than as a realisation of a different phoneme (/p/) whose realisations in all three commutative series are voiceless ([p^h] or [p], this is not because of phonetic similarity or orthography or functionalists' linguistic consciousness but because of the identical proportional relation of distinction that exists between [b]s and other segments in each of the different commutative series. The principle of the commutation test fundamentally and closely resembles that of the theory of the **micro-phoneme** and the **macro-phoneme** proposed in 1935 by the American linguist, William Freeman Twaddell (1906–82).

A **relevant feature** is identified in the course of the commutation test performed on a corpus of data obtained from a given language under phonological analysis. Unlike **distinctive features**, with which **generative phonology** operates [*see* GENERATIVE PHONOLOGY], there is no universal framework of relevant features set up *a priori*. Furthermore, the internal structure of a relevant feature is a complex of multiple non-dissociable distinctive phonic features, some of which may be present in some phonetic contexts while others may not be present in other phonetic contexts. Here lies a difference between a **relevant feature** on the one hand and a **distinctive feature** à la generative phonology on the other, since the latter refers to a single

phonic feature. Yet another difference is that a relevant feature is not binary, while a distinctive feature in generative phonology always is. Thus, for example, the relevant features 'nasal' (as in /m/) and 'non-nasal' (as in /p/ and /b/) in English consonant phonemes which are opposed to each other are two different relevant features, and should never be confused with [+nasal] and [-nasal] as used in generative phonology, where they are seen as deriving from the single distinctive feature [nasal]. It goes without saying that, for example, the relevant features 'bilabial' (as in /p/), 'apical' (as in /t/), 'velar' (as in /k/), etc., in English consonant phonemes which are opposed to each other, are not binary.

We shall now look in some detail at the question of the internal structure of a relevant feature. For example, the relevant feature 'bilabial' in English consists of not only the bilabial closure but also all the other concomitant physiological phenomena occurring in the oral and pharyngeal cavities. To consider another example, the relevant feature 'voiced' (in, e.g. /b/) in English is a complex of glottal vibration, a relatively lax muscular tension in the supraglottal vocal tract and all the other concomitantly occurring physiological phenomena when, for example /b/ is opposed to /p/, /d/ is opposed to /t/, /z/ is opposed to /s/, and so on. Glottal vibration is partially or entirely absent when /b/, /d/, /z/, etc. occur in post-pausal or pre-pausal position (e.g. in *bark*, *cab*, etc.), but this does not change 'voiced' into 'voiceless' nor does it give primacy to the phonic feature **fortis** (i.e. relatively great muscular tension), which is opposed to the phonic feature **lenis**, over voicelessness, or even to the exclusion of voicelessness.

Such absence of a certain phonic feature is dictated by a particular phonetic context in which the relevant feature occurs, for the voicedness does occur in all those different phonic contexts that are favourable to voicing – say, in intervocalic position. A **relevant feature** in a given language is identified, in spite of any minor variation observed in terms of the presence or absence of some of its multiple non-dissociable distinctive phonic features, as a unitary entity which phonologically functions as a single global unit in opposition to one or more relevant feature(s) in the same language, which also function(s) phonologically as (a) single global unit(s). The term **non-dissociable**, used in definitionally characterising the relevant feature, is therefore to be taken in this particular sense and not in the sense of 'constant'. It may be the case that the common base of the member phonemes of a phonological opposition in a given language is not found in any other phoneme(s) of the same language. For example, in English, /m/ (defined as 'bilabial nasal'), /n/ ('apical nasal') and /ŋ/ ('velar nasal') share the common base, 'nasal', which is not found in any other phonemes of this language. In such a case, the phonemes are said to be in an **exclusive relation**; that is, the common base is exclusive to the phonemes in question. Some functionalists suggest the term '**exclusive opposition**' to designate conveniently this type of phonological opposition, whose member phonemes are in an exclusive relation. An exclusive opposition is of particular importance in functional phonology, as we shall see below.

On the other hand, it may be the case that the common base of the member phonemes of a phonological opposition in a given language is found in one or more phonemes of the same language. For example, again in English, /p/ ('voiceless bilabial non-nasal') and /t/ ('voiceless apical non-nasal') share the common base 'voiceless non-nasal' which is also found in /k/ ('voiceless velar non-nasal') of this language. In such a case, /p/ and /t/ are said to be in a **non-exclusive relation**, and some functionalists suggest the term **non-exclusive opposition** to designate conveniently this type of phonological opposition, whose member phonemes are in a non-exclusive relation.

The common base of the phonemes of an exclusive opposition – provided that it is neutralisable (see below) – (but not of a non-exclusive opposition) is the **archiphoneme**, which may be defined as the sum of the relevant features of the (two or more) phonemes of an exclusive opposition.

An exclusive opposition may or may not be a **neutralisable opposition**. However, a neutralisable opposition is bound to be an exclusive opposition; it is never a non-exclusive opposition. This brings us to the concept of **neutralisation**, which may be illustrated as follows. In English, /m/–/n/–/ŋ/ (that is, the opposition between /m/, /n/ and /ŋ/) is operative in, say,

moneme-final position (cf. *rum* vs *run* vs *rung*). It is, however, not operative, e.g. moneme-medially before /k/ (cf. *anchor*) or /g/ (cf. *anger*), that is, there is no possibility of having /m/–/n/–/ŋ/ in such a position. According to functionalists, /m/–/n/–/ŋ/, which is operative in moneme-final position (the position of relevance for this phonological opposition), is neutralised in the position describable as 'moneme-medially before /k/ or /g/' (the position of neutralisation for this phonological opposition). This neutralisation results from the fact that the opposition between the relevant features, 'bilabial' (in /m/), 'apical' (in /n/) and 'velar' (in /ŋ/), which is valid in moneme-final position, is cancelled (note, not 'neutralised') moneme-medially before /k/ or /g/. What is phonologically valid in the latter position is the common base of /m/, /n/ and /ŋ/, which is none other than the archiphoneme /m–n–ŋ/ definable as 'nasal'.

/m/–/n/–/ŋ/ in English is, then, said to be a neutralisable opposition which is operative in the position of relevance but is neutralised in the position of neutralisation. Since the relevant feature 'nasal', which alone characterises the archiphoneme /m–n–ŋ/, is not found in any other phoneme in English, the opposition /m/–/n/–/ŋ/ is, of course, an exclusive opposition. The phonic feature of velarity, which characterises the realisation (i.e. [ŋ] in [ˈæŋkə] or [ˈæŋgə]) of this archiphoneme, is not part of its phonological characteristics; rather, the occurrence of velarity in its realisation is merely dictated by the fact that /k/ or /g/ which follows the archiphoneme is phonologically velar.

The concept of neutralisation presented above is largely in line with Martinet and his associates' phonological analysis. In contrast, Trubetzkoyan phonological analysis is incapable of accounting for the neutralisation of /m/–/n/–/ŋ/ moneme-medially before /k/ or /g/ in English, for Trubetzkoy always presents a phonological opposition as consisting of two (and not more than two) phonemes, and operating with other phonological concepts compatible with such a concept of phonological opposition. His presentation of various types of phonological opposition (**bilateral**, **multilateral**; **proportional**, **isolated**; **privative**, **gradual**, **equipollent**; **constant**, **neutralisable**) is always such that a phonological opposition is formed by two phonemes. (See Trubetzkoy 1939/1969: 67–83, for a detailed explanation of these types of phonological opposition.)

In a case where a neutralisable opposition happens to be a phonological opposition consisting of two phonemes, Trubetzkoy accounts for its neutralisation in the following way. For instance, in German, /t/–/d/, which is a bilateral opposition operative in, say, moneme-initial prevocalic position (cf. *Tank*, *Dank*), is neutralised in moneme-final position (cf. *und*, *freund*(*lich*)), where only the archiphoneme is valid and is 'represented' by the unmarked member of the opposition (/t/? [t]?). The phonetic or phonological status of the archiphoneme representative is a moot point over which there exists disagreement even among functionalists. As is evident from Trubetzkoy's use of the notion of the **mark** and the associated notions of **marked** and **unmarked**, a neutralisable opposition is supposed to be a privative opposition formed by the marked and the unmarked phonemes.

Martinet and the majority (if not all) of his associates give much the same account of the neutralisation of such an exclusive opposition consisting of two phonemes, except that they generally do not resort to the concept of bilateral opposition and to the concept of the archiphoneme representative. It should be noted in passing that a few functionalists do not operate with the notions of the mark, marked and unmarked in their account of any neutralisation (see Akamatsu 1988: chapter 11).

However, it is important to note that functionalists' concept of neutralisation is an inevitable consequence of their prior belief in the concept of phonological opposition.

It should be mentioned in this connection that some functionalists (see Vachek 1966: 62; Buyssens 1972a, 1972b) have abandoned the concept of the archiphoneme while claiming to operate with the concept of neutralisation, a stance which has come under fire from other functionalists. The debate on this issue can be pursued through the writings of Akamatsu, Buyssens and Vion in issues of *La Linguistique* from 1972 to 1977. It is also discussed in Davidsen-Nielsen (1978) and in Akamatsu (1988, 1992a, 1992b).

Finally, a few words are in order about the concepts of the **mark**, **marked** and **unmarked**, and the concept of **correlation**.

Most functionalists consider that one of the two phonemes of a privative opposition possesses the mark and hence is marked, while the other phoneme lacks it and hence is unmarked. Thus, with regard to /d/–/t/ in English, for example, /d/ is said to possess the mark (i.e. voice) and is marked, while /t/ is said to lack it and is hence unmarked. Some functionalists disagree with this idea (see Akamatsu 1988: chapter 11).

A correlation consists of a series of bilateral privative proportional oppositions and involves the concept of the mark. For example, a partial phonological system like

p	t	k
b	d	g

is a simple correlation wherein /p/ and /b/, /t/ and /d/, and /k/ and /g/ are said to be **correlative pairs**; /p/, /t/ and /k/ are said to be unmarked while /b/, /d/ and /g/ are said to be marked, the mark of correlation being voice. Furthermore, for example, a partial phonological system like

p	t	k
b	d	g
m	n	ŋ

is a **bundle of correlations** wherein, in addition to the above-mentioned simple correlation with voice as the mark, there is a further correlation whose mark is nasality, which separates /p t k b d g/, on the one hand, and /m n ŋ/, on the other, from each other, so that the former group of phonemes is said to be unmarked and the latter marked.

T. A.

Suggestions for further reading

Akamatsu, T. (1992) *Essentials of Functional Phonology*, Louvain-la-Neuve: Peeters, particularly Chapters 3–6 and Chapter 9.

Martinet, A. (1964) *Elements of General Linguistics*, London: Faber and Faber, particularly Chapters 1–3.

Trubetzkoy, N.S. (1939/1969) *Principles of Phonology*, trans. C.A.M. Baltaxe, Berkeley, Calif.: University of California Press, particularly pp. 31–45, 66–89 and 228–41.

Functionalist linguistics

Functionalism in linguistics arises from the concerns of Vilém Mathesius (1882–1945), a teacher at the Caroline University in Prague, who in 1911 published an article, 'On the Potentiality of the Phenomena of Language' (English translation in Vachek 1964), in which he calls for a non-historical approach to the study of language. Some of the linguists who shared his concerns, including the Russian, Roman Osipovich Jakobson (1896–1982), and who became known as the **Prague School Linguists**, met in Prague for regular discussions between 1926 and 1945, but the Prague School also included linguists not based in Czechoslovakia (Sampson 1980: 103), such as the Russian, Nikolaj Sergeyevich Trubetzkoy (1890–1938) [*see also* FUNCTIONAL PHONOLOGY]. More recently, functionalism has come to be associated with the British linguist Michael Alexander Kirkwood Halliday (b. 1925) and his followers.

It was the belief of the Prague School linguists that 'the phonological, grammatical and semantic structures of a language are determined by the functions they have to perform in the societies in which they operate' (Lyons 1981: 224), and the notions of **theme**, **rheme** and **functional sentence perspective**, which are still much in evidence in Halliday's work (see especially Halliday 1985/1994), originate in Mathesius's work (Sampson 1980: 104).

J.R. Firth (1890–1960), who became the first professor of general linguistics in England, took what was best in structuralism and functionalism and blended it with insights provided by the anthropologist Bronislaw Malinowski (1884–1942). Because both Firth and Malinowski were based in London, they and their followers, including Halliday and R.A. Hudson (b. 1939), are sometimes referred to as the **London School** (Sampson 1980: chapter 9).

Malinowski carried out extensive fieldwork in the Trobriand Islands and argues that language is not a self-contained system – the extreme structuralist view – but is *entirely* dependent on the society in which it is used (in itself also an extreme view). He maintains that language is thus dependent on its society in two senses:

1. A language evolves in response to the specific demands of the society in which it is used.

2. Its use is entirely context-dependent: 'utterance and situation are bound up inextricably with each other and the context of situation is indispensable for the understanding of the words' (Malinowski 1923).

He maintains (Sampson 1980: 225):

> that a European, suddenly plunged into a Trobriand community and given a word-by-word translation of the Trobrianders' utterances, would be no nearer understanding them than if the utterances remained untranslated – the utterances become comprehensible only in the context of the whole way of life of which they form part.

He distinguishes the immediate **context of utterance** from a general and generalisable **context of situation**, and argues that we must study meaning with reference to an analysis of the functions of language in any given culture. For example, in one Polynesian society Malinowski studied, he distinguished three major functions:

- The **pragmatic function** – language as a form of action.
- The **magical function** – language as a means of control over the environment.
- The **narrative function** – language as a storehouse filled with useful and necessary information preserving historical accounts.

Malinowski is perhaps best known, however, for his notion of **phatic communion**. By this, he means speech which serves the function of creating or maintaining 'bonds of sentiment' (Sampson 1980: 224) between speakers (Malinowski 1923: 315); English examples would include idle chat about the weather, and phrases like 'How are you?'

In connection with the idea of context of situation and the idea of function as explanatory terms in linguistics, Firth points out that if the meaning of linguistic items is dependent on cultural context, we need to establish a set of categories which link linguistic material with cultural context. Thus, the following categories are necessary in any description of linguistic events (Firth 1950/1957b: 182):

A. The relevant features of participants: persons, personalities.
   (i) The verbal action of the participants.
   (ii) The non-verbal action of the participants.
B. The relevant objects.
C. The effect of the verbal action.

According to Firth, the notion that 'meaning is function in context' needs formal definition so that it can be used as a principle throughout the theory; both the smallest and the largest items must be describable in these terms.

To achieve this formal definition, Firth uses a Saussurean notion of system, though his use of the term is more rigorous than Saussure's. Firth's **system** is an enumerated set of choices in a specific context. Any item will have two types of context: the context of other possible choices in the system, and the context in which the system itself occurs. The choices made in the systems will be functionally determined.

Halliday works within a highly explicit systemic theory which is clearly Firthian, but more fully elaborated, and the grammars written by scholars in the Hallidayan tradition are, therefore, often called **systemic grammars**. When accounting for how language is used, that is, for the choices speakers make, however, Halliday prefers to talk of **functional grammar**; as he puts it (1970: 141):

> The nature of language is closely related to … the functions it has to serve. In the most concrete terms, these functions are specific to a culture: the use of language to organise fishing expeditions in the Trobriand Islands, described half a century ago by Malinowski, has no parallel in our own society. But underlying such specific instances of language use, are more general functions which are common to all cultures. We do not all go on fishing expeditions; however, we all use language as a means of organising other people, and directing their behaviour.

This quotation both shows the influence from Malinowski and hints at how Halliday generalises the notion of function in order that it may become more widely applicable as an explanatory term. Halliday's theory of language

is organised around two very basic and common-sense observations: that language is part of the social semiotic, and that people talk to each other. The theory of language is part of an overall theory of social interaction, and from such a perspective it is obvious that a language must be seen as more than a set of sentences. Rather, language is seen as text, or **discourse** – the exchange of meanings in interpersonal contexts, and the creativity of language is situated in this exchange. A Hallidayan grammar is therefore a grammar of meaningful choices as much as of formal rules.

By saying that language is part of the **social semiotic**, Halliday means that the whole of the culture is meaningful, is constructed out of a series of systems of signs. Language is one of these systems – a particularly important one, partly because most of the other systems are learned through, and translatable into, language, and partly because language *reflects* aspects of the situations in which it occurs.

As a social system, language is subject to two types of variation: variation according to *user*, and variation according to *use*. The first type of variation is in accent and dialect, and it does not, in principle, entail any variation in meaning. Different dialects, are, in principle, different ways of saying the same thing, and dialectal linguistic variation reflects the social order basically in terms of geography. Variation according to *use* (**register variation**), however, produces variation in meaning. A **register** is what you are speaking at a particular time, and is determined by what you and others – and which others – are doing there and then; that is, by the nature of the ongoing social activity. Register variation therefore reflects the variety of social processes speakers engage in. The notion of register is used to relate the functions of language (see below) to those aspects of the situation in which language is being used that are the relevant aspects for us to include under the notion of **speech situation** or **context**. According to Halliday, the relevant aspects of the situation are what he calls, respectively, **field**, **tenor** and **mode**.

The **field of discourse** is *what is going on* – the social action, which has a meaning as such in the social system. Typically, it is a complex act in some ordered configuration, in which the text is playing some part. It includes 'subject matter' as one aspect of what is going on.

The **tenor of discourse** relates to *who is taking part* in the social action. It includes the role structure into which the participants in the discourse fit; that is, socially meaningful participant relationships, whether these are permanent attributes of the participants – mother–child – or whether they are role relationships that are specific to the situation – doctor–patient. Speech roles which may be created and vary as the discourse progresses, such as speaker and listener, and **knower** and **non-knower** (Berry 1981) are also included.

The **mode of discourse** deals with the role that the text or language itself is playing in the situation at hand. It refers to the particular status that is assigned to the text within the situation and to its symbolic organisation. A text will have a function in relation to the social action and the role structure (plea, reprimand, informing); it will be transmitted through some channel (writing, speech); and it will have a particular rhetorical mode (formal, casual).

It is now possible to determine the general principles governing the way in which these semiotic aspects of the situation are reflected in texts. Each linguistically relevant situational component will tend to determine choices in one of the three semantic components that language comprises, by virtue of being the system through which we talk to each other.

Since it is the means whereby we talk to each other, language has two major functions. It is a means of *reflecting* on things – that is, it has an **ideational function** – and it is a means of *acting* on things. But, of course, the only 'things' it is possible to act on symbolically (and language is a symbolic system) are *people* (and some animals, perhaps), so the second function of language is called the **interpersonal function**.

Finally, language has a function which enables the other two functions to operate – a function that represents the language user's text-forming potential. This is called the **textual function**, and 'it is through the options in this component that the speaker is enabled to make what he says operational in context, as distinct from being merely citational, like lists of words in a dictionary, or sentences in a grammar book' (Halliday 1975: 17).

As indicated in the quotation just given, for each of the functions that language has for its users there is a correspondent component of the semantic system of language from which choices are made somewhat as follows:

The **field of discourse** – what is going on – will tend to determine choices in the **ideational component** of the language, among classes of things, qualities, quantities, times, places and in the transitivity system [*see* SYSTEMIC-FUNCTIONAL GRAMMAR].

The **tenor of discourse** – who is taking part – will tend to determine choices in the **interpersonal systems** of mood, modality, person and key; and in intensity, evaluation and comment.

The **mode of discourse** – the part the text is playing – will tend to determine choices in the **textual component** of language, in the system of voice, among cohesive patterns, information structures and in choice of theme. The concept of genre, too, is an aspect of what Halliday sees as mode.

But exactly *what* choices are made is subject to variation according to two further factors, namely register and code. **Register** is the concept of text variety which allows us to make sensible predictions about the kind of language which will occur in a given situation – that is, in association with a particular field, tenor and mode. Register is (Halliday 1978: 111) 'the configuration of semantic resources that the member of a culture typically associates with a situation type'. However, members of different (sub)cultures will differ as to which text type they tend to associate with which situation type, and differences of this supralinguistic, sociosemiotic type are explained in terms of Bernstein's (1971) notion of the **code**, which acts as a filter through which the culture is transmitted to a child.

It is important to remember that the interpersonal, ideational and textual functions mentioned here are the **macrofunctions** of the semantic system of language; they are functions that Halliday thinks of as universal. In addition, of course, language serves a number of **microfunctions** for its users, such as asking for things, making commands, etc., but the proper heading under which to consider these is that of speech-act theory [*see* SPEECH-ACT THEORY].

K. M.

Suggestions for further reading

Halliday, M.A.K. (1978) *Language as Social Semiotic*, London: Edward Arnold.

Sampson, G. (1980) *Schools of Linguistics: Competition and Evolution*, London: Hutchinson, Chapters 5 and 9.

G

Generative grammar

This article is about the body of work which owes its original inspiration to the insights of Noam Chomsky in the mid-1950s and has been continually revivified by his insight up to the present. It has become one of the most influential syntactic theories of the twentieth century and, although by no means all practising linguists adhere to its principles and results, none can ignore them. Since its inception there have been huge developments in the theory and reactions to it have often been violent. In the mid-1960s work on the developing theory of 'transformational generative grammar' (TG) was perhaps coherent enough for one to be able to talk of a school of 'transformational' linguistics. This has not been possible for many years. Many who grew up within the model have gone on to develop theories of their own, often in reaction to the current work of Chomsky, and even among those who would describe themselves as generative linguists there is considerable divergence. That having been said, many linguists adhere to some version of a grammar that owes its intellectual genesis to one or other of the continually developing models offered by Chomsky. This entry is organised into four sections, based loosely around some of his more influential publications: *Syntactic Structures* (1957); 'Standard Theory', developing from *Aspects of the Theory of Syntax* (1965); 'Principles and Parameters', the theory developing out of *Lectures on Government and Binding* (1981) and *Barriers* (1986a); and some of Chomsky's most recent ideas, stimulated by *The Minimalist Program* (1995).

Syntactic Structures

When *Syntactic Structures* was published in 1957, the position it took on the nature of linguistic activity was sufficiently at odds with that of the prevailing orthodoxy that it was appropriate to refer to it as revolutionary. The first chapter declared that **grammar** was an autonomous system, independent of the study of the use of language in situations, and of semantics, and furthermore that it should be formalised as a system of rules that generates an infinite set of sentences.

This approach contrasted sharply with the (then) fashionable orthodoxy that believed that the application of appropriate procedures to a corpus of data would yield a grammatical description. Chomsky rejected the use of a corpus, proposing instead that the empirical adequacy of a grammar should not be judged by whether it accounted for some finite body of observable data but by whether it could generate an infinite number of grammatical sentences and in doing so account for certain types of intuitive judgements that native speakers have about their language. Among these judgements are **grammaticality judgements**: that is, that a string of words, particularly a novel string, is or is not a well-formed sentence; that certain sentences are **ambiguous**, i.e. that a single sentence can have more than one interpretation; that distinct sentences can **paraphrase** each other, i.e. that distinct sentences can, in particular respects, have identical interpretations; that certain **sentence types** (affirmative and negative, declarative and interrogative, etc.) can be systematically related to each other, and so forth. Judgements

of this kind, it is claimed, constitute what speakers know about their language, and in addition to being able to generate all the grammatical sentences of the language a grammar should also account for this knowledge.

It was mentioned above that Chomsky proposed that grammar should be considered as an autonomous system, independent of semantic or phonological systems, though, of course, bearing a relation to them. Furthermore, he proposed that the syntax itself should consist of a number of distinct but related levels, each of which is characterised by distinct rule types and bears a particular part of the descriptive burden. We shall look briefly at the two most important components in a syntactic structures model: the **phrase-structure** (**PS**) component and the transformational component.

The PS component consists of a set of PS rules which formalise some of the traditional insights of **constituent-structure** analysis. Consider, for example, the following set of rules, adapted from Chomsky (1957: 26 and 111; items in curly brackets, { }, are alternatives, e.g., number is either sing[ular] or pl[ural]).

Sentence → NP + VP
NP → T + N + Number
Number → {sing, pl}
VP → Verb + NP
Verb → Aux + V
Aux → Tense
Tense →{present, past}
NP Noun phrase
VP Verb phrase
T (articles etc)
Aux: auxiliary (simplified to cover only a marker of tense)

Each rule is an instruction to rewrite the symbol on the left of the arrow as the symbol or symbols on the right of it: informally, it can be construed as 'the category on the left of the arrow has the constituent(s) specified on the right of the arrow, and in the order shown'.

The PS component will need to be supplemented by a **lexicon**, a list of the lexemes of the language, each one characterised with its lexical category (that MAN and BALL are nouns, that HIT is a verb, and so on) with information about their sub-categorisation (that HIT is a transitive verb and so on), and with information about its pronunciation and its sense.

Using these PS rules and a rule that inserts lexical items into the appropriately labelled nodes, a derivation from this grammar can then be represented by the tree shown in Figure 1 (adapted from Chomsky 1957: 27).

We will refer to lexicalised structures generated by the PS rules as **underlying structures**. One small reason should be immediately apparent: the postulated underlying structure shown in Figure 1 is characterised by a degree of abstraction. The NPs are analysed as containing a marker of number, and the analysis of the verb form *hit* as a past tense form is shown by postulating the item 'Tense', preceding the verb itself. None of these items has an overt realisation in the actually occurring form of the sentence, its **syntactic surface structure**. We will see the reason for these analyses below.

PS rules of this kind can be elaborated to capture certain basic facts about the grammar of English, or indeed any other language. They capture relations of **constituency** and **order**. Strings like *the man*, *the ball* and *hit the ball* are **proper constituents** of the sentence, whereas a string like *man hit* is not. In English, articles are ordered before nouns within noun phrases; the verb precedes its object within the VP and the subject precedes the VP. They can also be used to capture facts about **functional relations** like subject, object, and main verb – the **subject** is the NP **daughter** of the Sentence node, the object is the NP daughter of the VP and **sister** of the main verb, and the **main verb** is a daughter of the VP, which is itself a sister of the subject. (A **node** is the daughter of the node immediately above it, which **dominates** it, as shown by the 'branches' of the tree. Sister nodes share a dominating node.) As we have noted, information about the **sub-categorisation** of lexical items (that HIT is a **transitive verb** and so requires to be followed by an NP) is to be found in the associated lexicon.

The **transformational component** consists of rules which perform a variety of functions. We will be interested in three: first, rules which relate particular sentence types to each other, as active sentences to their passive counterparts; second, a set of rules that accounts for **morphological operations** of various kinds,

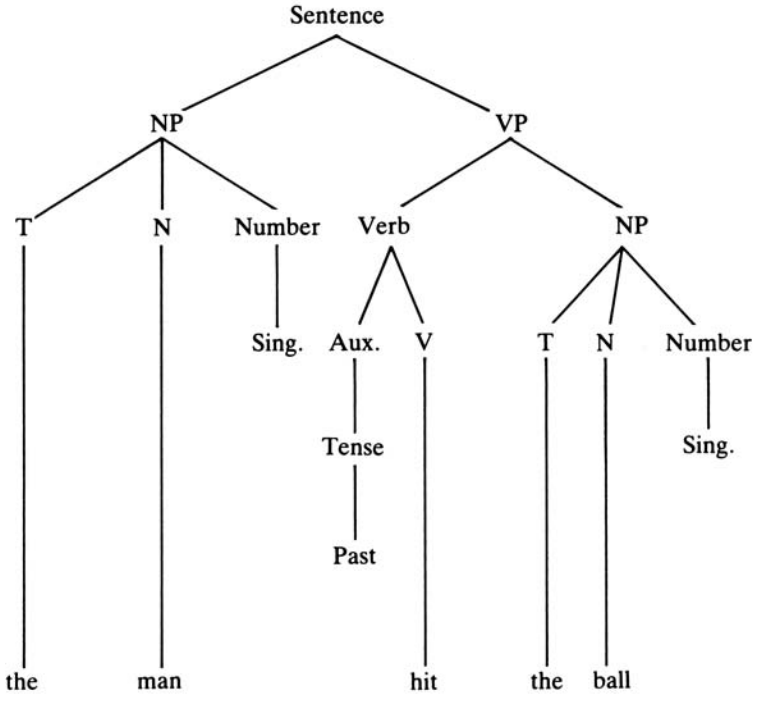


Figure 1

like number agreement between subject and verb; finally, those rules that are responsible for generating complex sentences.

A **transformational rule** is a rule that maps one syntactic-analysis tree into another. If PS rules can be informally thought of as instructions to build up structures like those in Figure 1, then a transformational rule can be informally thought of as an instruction to change one structure into another. A rule that takes one structure as input and outputs another structure, will obviously need two parts: a **structural analysis** (**SA**) specifying the input, the structure to which the rule applies; and a **structural change** (**SC**) specifying what the output structure will be. A double-shafted arrow is often used to signify a transformational rather than a PS rule. A version of the **passive transformation** (modified from Chomsky 1957: 112) is:

Passive (optional)
SA: NP - Aux - V - NP
SC: Xl - X2 - X3 - X4 ⇒ X4 - X2 + ($_{pass}$BE + *en*) - X3 - ($_{pp}$by - Xl)

The structure in Figure 1 can indeed be analysed as the SA stipulates: it contains the string NP - Aux - V - NP, so it can thus be subjected to the rule yielding the derived structure shown in Figure 2.

Early transformational grammars assumed a rule like the passive transformation to be a complex unitary operation and this may well reflect the native speaker's intuition of the matter. The rule is, however, a very complex operation and from a formal point of view can be broken down into a number of **elementary transformations**, each performing a single operation, adjoining, moving, deleting or copying a constituent. Several of these operations can be exemplified in the passive transformation: *by* is adjoined to the subject NP *the man* to create a new piece of structure, the PP (prepositional phrase) *by the man;* this PP is then moved to final position in the VP; the object NP is moved to the front of the sentence and adjoined as a daughter of the topmost Sentence node; a new passive auxiliary is introduced, and so forth. Perhaps the most compelling reason for considering

Passive to be a series of small operations rather than one complex one is that, while it may be possible to specify exactly the structural change for each of the component operations, it is far from clear how to do this for a very complex operation. Given the version of the rule above, just how the derived structure shown in Figure 2 was constructed is actually a mystery, yet a formal grammar should be very precise on matters of this kind.

At this point there is a conflict between an intuition that 'construction types' should be matched as wholes, and the formal operation of grammatical rules, which would prefer to atomise complex operations. In the earliest transformational work the preference was to follow traditional intuitions and to relate construction types as wholes to one another, but this leads to prodigious formal difficulties and later work takes the opposite approach, as we shall see, and construction types are atomised into their component elementary transformations. It should also be noted that the transformation is marked as 'optional'. This is for the obvious reason that not all sentences are passive sentences. Comparable transformations, often also complex and invariably also optional, were proposed to derive interrogatives from declaratives, negatives from affirmatives, and so on. Combinations of these operations will derive more complex structures like interrogative, negative passives, and so forth. The insight that operations of this kind encapsulates is that of **sentence-relatedness**.

The second set of transformations mentioned above were those concerned with morphological operations – the agreement rules of English are an example – and with word formation in general, of which past tense formation is an example. The traditional account of **number agreement** is that the main verb must agree in number with the subject, an insight that can be captured straightforwardly by a transformation. Given that subject and main verb can be identified in structural terms in the kind of way noted above, we need a rule that uses this structural information to copy a marker of number from

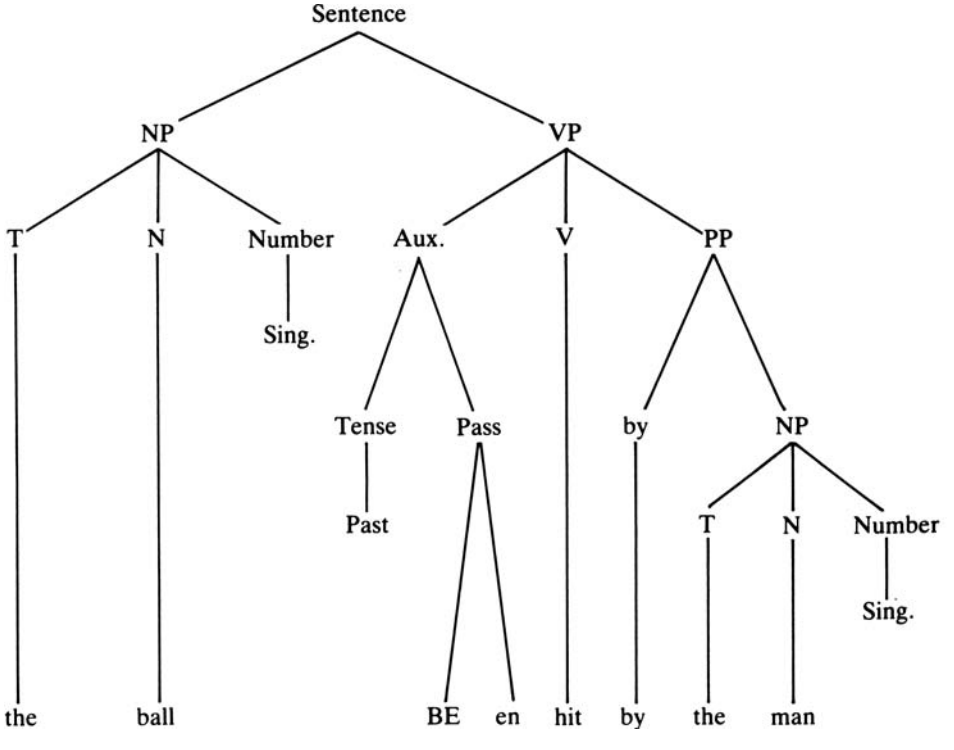


Figure 2

the subject NP into the verb group. There is, however, a little bit more to it than that, since we need to be sure that the number marker on the verb group occurs in the right place, which is the tensed element within the verb group, whether this is an auxiliary verb (*is/are walking*, *has/have walked*) or the main verb itself (*walk/walks*). This can be ensured by copying the number marker into the tense constituent itself. The effect of such an operation is shown in Figure 3.

Before pursuing this matter further we should briefly consider how tense is marked. In English, the marker of past tense in verbs is most frequently a suffix, *-ed*, on the verb stem: *walk-s* (present) vs. *walk-ed* (past). In this respect our example, *hit*, is an **irregular past-tense formation**, and we will come to that in due course. However, in our grammar and in the analysis displayed in Figure 1, the fact that *hit* is analysed as a 'past-tense verb' is shown by a constituent labelled 'Tense' positioned before rather than after the verb stem.

This apparently curious analysis is in fact rather ingenious, since it captures several important regularities in the formation rules for tensed verb groups in English. First, **tense** is invariably realised on the initial constituent of the verb group, irrespective of whether this is an auxiliary (*is/was walking*, *has/had walked*, etc.) or the main verb itself (*walks/walked)*. Second, whereas the auxiliaries are optional constituents of the verb group, all **finite sentences** must be tensed. Making tense obligatory at the beginning of the verb group captures this fact. The correct surface position of the actual tense marker can be ensured by proposing a rule that positions the tense marker as a suffix on whatever immediately follows it in the final derivation, and indeed such a transformation, later called **affix hopping**, was proposed in *Syntactic Structures*. It should be clear that this rule will also account for the position of the marker of number agreement: if it is copied into the tense marker, then where the tense marker goes, so does the number marker. The reader can easily imagine the effect of affix hopping on the structure in Figure 3.

Consider, finally, the analysis of the passive. This introduces a passive auxiliary, 'BE + *en*', as the final constituent in the string of auxiliaries: 'Aux' in the SA (Structural Analysis) will include whatever auxiliaries there are in the active sentence, so the stipulation 'Aux + pass' will get the ordering right; BE recognises the fact

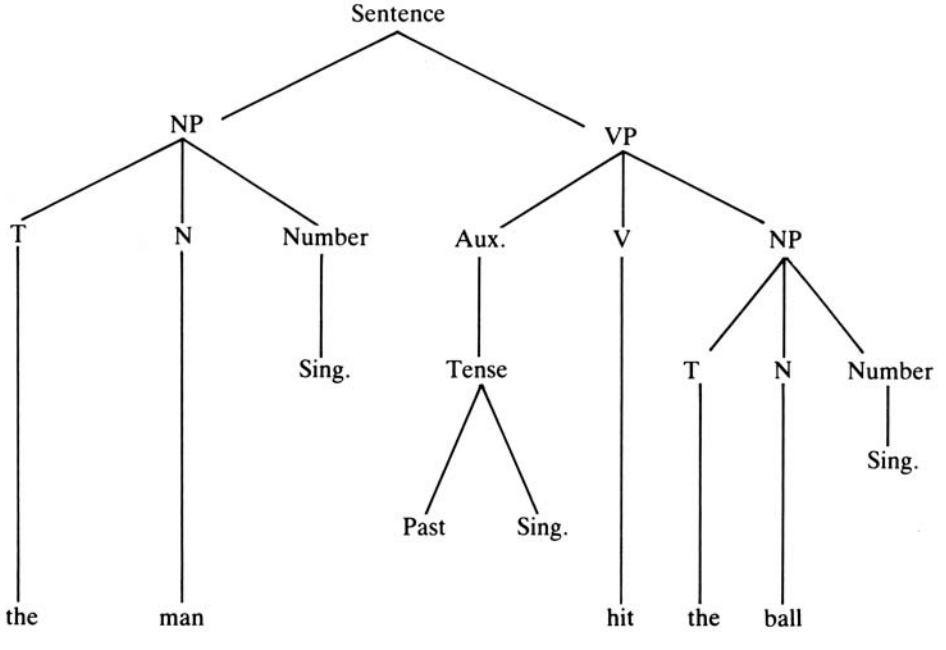


Figure 3

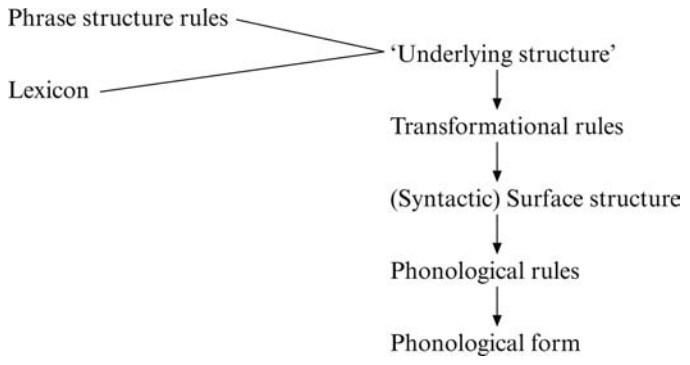


Figure 4

that the passive auxiliary is indeed a form of BE; *en* recognises the fact that the verb that follows the passive auxiliary always does so as a passive participle. Now, if *en*, like tense, is defined as an affix, affix hopping will ensure the correct surface facts. The reader can see that if the number agreement rule and affix hopping are applied to the structure in Figure 2, the resultant sentence will be *The ball was hit by the man.* It will be clear that, whereas the sentence-relating rules, like Passive, are optional, the morphological rules will generally need to be obligatory.

We have only examined a part of the extremely complex formation rules for the English verb group, but it must be clear that a few simple but powerful rules can both generate the correct sequence of forms and exclude ungrammatical ones, while at the same time capturing important generalisations about the structure of the language. It is worth mentioning that the elegance and insightfulness of this account was instantly recognised, and this was an important factor in ensuring the initial success of the transformational way of looking at syntax.

The structure that emerges after the operation of all the transformations is known as the **syntactic surface structure**. This will then need to go off to the morphophonemic and phonological components to receive its final phonological form. The rules in these components need not detain us, but it is perhaps worth noting that a complete description will clearly need a set of **morphophonemic rules** to specify the shapes of word forms. So, for example, there will need to be rules of the kind:

HIT + past → *hit* (the past tense form of *hit*)
HIT + *en* → *hit* (the passive participle of *hit*)
MAN + pl → *men* (the plural form of *man*)

to accommodate irregular morphology, followed by others of the kind:

WALK → *walk*
past → *-ed* (the past marker for regular verbs)

to accommodate regular morphology. The kinds of rules that are at issue should be clear and need not detain us further.

It will be helpful at this point to summarise the overall structure of the model as it applies to simple sentences, and this is shown in Figure 4.

Within this model all sentences will have two levels of syntactic description: an underlying structure created by the PS rules, and a surface structure resulting from the operation of the transformations. Several things follow from this.

Perhaps most significant is that it draws particular attention to the fact that language is a complex structural organisation. All the rules we have looked at work on structures, or subparts of structures, either developing them or modifying them. This **structure dependence** of the rules of language is held by all models of transformational grammar to be one of the characterising features of human language.

Another such feature is that the relationship between underlying and surface structure enables us to capture many of the generalisations mentioned in the opening paragraphs. Thus, a paraphrase relation between superficially distinct

sentences – such as, for example, an active sentence and the corresponding passive – arises from the fact that both derive from the same underlying structure. By contrast, an ambiguous sentence arises when a transformational derivation collapses distinct underlying structures onto a single surface structure.

Finally we may mention that this description allows us to identify a special class of sentences, **kernel sentences**, that have traditionally been recognised as of particular interest: simple active, declarative, affirmative sentences. The distinguishing feature of kernel sentences is that they are those sentences derived with the absolute minimum of transformational machinery, the obligatory transformations alone. As we have seen, the obligatory transformations are in essence those that account for number agreement, the surface ordering of markers of tense, and similar 'housekeeping' operations. Other sentences – questions, negatives and the like – will undergo, in addition, one or more of the optional structure-changing operations.

The third group of transformations mentioned was those responsible for the generation of **complex sentences**, sentences which themselves contain sentences, or sentence-like structures as constituents: for example ($_{s1}$*Kim said* ($_{s2}$*that his mother expected him* ($_{s3}$*to tell John* ($_{s4}$*that* … , where the various embedded sentences are identified as S1, S2, and so forth. This process is clearly very productive. In *Syntactic Structures*, the embedding operation is performed by a distinct set of transformations called **generalised transformations**, which take as input two sentence structures, and yield as output a single structure with one sentence embedded into the other. The problem in general is obviously an important one, but the particular solution adopted in *Syntactic Structures* was extraordinarily complicated, led to considerable formal difficulties, and was soon abandoned, so we will not pursue the matter here. It will be clear that the outline offered above says nothing about the generation of complex sentences.

There are two final remarks to be made about this model. The first has to do with the relationship between **syntax and semantics**. In *Syntactic Structures*, Chomsky is at pains to stress the autonomy of syntax, in particular with regard to semantics. He does, however, draw attention to the fact that a description of a language must have the means to discuss the relation between syntax and semantics, and points out that in this respect kernel sentences have a privileged part to play, since, if kernel sentences are in some sense 'basic' sentences, an understanding of how they are understood is the key to understanding how sentences in general are understood. How later versions of the theory come to terms with this insight (again, a rather traditional insight), we will see.

The second remark has to do with Chomsky's interest in language as a formal system of rules and the fact that this led him to explore the mathematical properties of various kinds of formal grammar. The immediate spur to this investigation was the claim that PS rules alone were inadequate to describe the range of structures found in a natural language. It was claimed, for example, that some structures found in natural language are literally impossible to generate with PS rules; this is particularly the case where potentially infinite nested dependencies are at issue (e.g., if$_1$, if$_2$ … then$_2$, then$_1$). There are some kinds of structures that can be generated using PS rules, but the description is clumsy and lacks generality (e.g., the rules for number agreement or the formation rules for auxiliary verbs in English).

While it may be possible to generate particular sentence types, it is not possible to relate them to each other formally in the grammar, which means that certain of the kinds of insight (especially those about sentence relatedness, etc.) mentioned above cannot be captured in PS grammar alone. Furthermore, it is impossible to generate certain occurring structures without also generating certain non-occurring structures. Many of these alleged inadequacies of PS rules have subsequently turned out not to be sustainable. Chomsky's work on formal grammar, however, remains of importance since the investigation of the mathematical properties of grammars provoked by *Syntactic Structures* remains an important field of investigation both in linguistics and in related disciplines, notably computer science, artificial intelligence and cognitive science. Chomsky's answer to the inadequacies of PS rules was to supplement a phrase-structure grammar with another, more powerful, kind of rule, the transformation. Interestingly, considering

the amount of attention paid to the formal properties of PS rules, *Syntactic Structures* contains no discussion of the mathematical properties of transformational rules. This, as we shall see, was soon a source of trouble.

Syntactic Structures triggered an intensive research programme: we only have space to look at a few aspects of this. Of the new syntactic machinery the powerful tool of different levels of structure related by transformations was particularly beguiling, since transformations appeared to offer a means of explaining the often amazingly complex relationships between the form of sentences and their understanding. An early and influential contribution was Lees' transformational account (1960/1963) of the formation and understanding of nominal forms. For example, the superficially similar *talking machine*, *eating apple* or *washing machine* differ in the kinds of relationships between the various parts: subject–verb, as in *the machine talks;* verb–object as in *NP eats the apple;* and verb–object of preposition, as in *NP washes NP in a machine.* Data of this kind seemed cut out for a transformational account: the various forms must be derived from different underlying structures (this accounts for the different interpretations) by transformational routes that have destroyed that structure (this accounts for the identical surface structures). A superficially appealing conclusion.

In syntax, intensive work on the structure of complex sentences eventually showed that it was possible to discard the unwieldy machinery of generalised transformations. A straightforward example will show the kind of thing that was at issue: in a *Syntactic Structures* type of grammar, the generation of relative clauses involved taking two sentences – say, *The cat died* and *We loved the cat* – and embedding one in the other with whatever consequent changes were necessary to yield *The cat that we loved died.* Instead of taking two sentences, it was suggested that the NP could be developed by a rule of the kind NP → Art N S, and permitting the S node to recycle through the rules. In this way an underlying structure could contain within itself a series of embedded sentences requiring only transformational machinery to tidy up the surface forms. Given this approach, the old optional generalised transformations responsible for the various embedding operations now become obligatory, being triggered by an appropriate underlying structure.

Another line of research looked at the derivation of different simple sentence types: for example, in *Syntactic Structures*, negative sentences would have been derived by an optional transformation inserting a negative element into an affirmative kernel. It was proposed that instead the underlying structure could contain an optional abstract negative marker, S → (neg) NP + VP. Now the transformational rule can be triggered by this marker to produce the appropriate negative sentence structure. A similar move is open to interrogative sentences: S → (Qu) NP + VP and, once again, the abstract interrogative marker triggers the interrogative transformation. As before, what was formerly an optional operation now becomes obligatory, conditional on the presence of the abstract marker.

As proposals of this kind increased, they began to have profound implications for the structure of the grammar. A small consequence was the demise of the notion of the kernel sentence. Kernel sentences, it will be recalled, were active, affirmative, declarative simple sentences derived by the application of obligatory transformations alone: the disappearance of a significant distinction between obligatory and optional transformations described above sounded the death knell for the kernel sentence. A more profound result was that the incorporation into underlying structures of more and more markers, like the negative and interrogative markers mentioned above, led to underlying structures becoming increasingly abstract. This in turn led to a requirement for ever-more-substantial transformational machinery to relate it to surface structures. And the explosion in the number of transformations created problems of controlling the way they operate and interact with each other; the formal implications of this are largely a 'theory-internal' problem. An interesting consequence was the exploration of an increasingly wide variety of syntactic facts, and the discovery of a range of syntactic problems that still defy proper description.

Perhaps the most profound consequence, however, was that the new ideas opened up the possibility of an interesting rapprochement between semantics and grammar.

Consider, for example, the interpretation of a negative sentence. One way of thinking of this is to suppose that understanding a negative sentence depends on the application of negation to the understanding of the corresponding affirmative sentence. In a *Syntactic Structures* model, formalising this procedure would require access to the underlying structure, to acquire an understanding of the kernel, and also a history of the transformational derivation of the sentence, to know whether the optional negative transformation has applied. However, if we suppose that there is a negative marker in the underlying structure itself and that this triggers off the application of the negative transformation, then all that is necessary for the semantic interpretation is already in the underlying structure, and can be read directly off it. The transformation would have no effect on the meaning, but be simply an automatic operation serving only to trigger off operations which would make the necessary surface adjustments. Katz and Postal (1964) proposed just this.

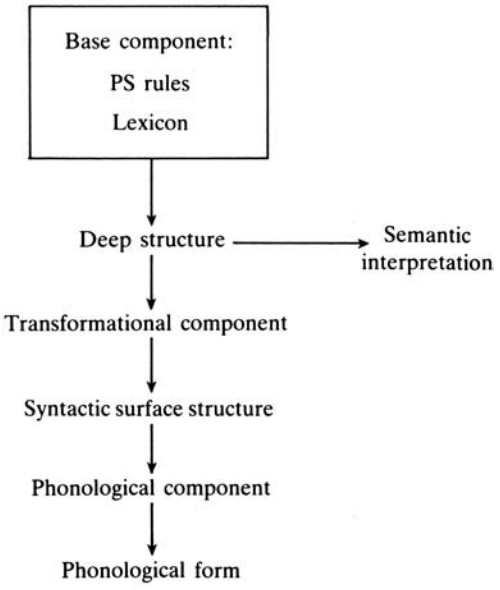
Standard theory

The modifications outlined at the end of the previous section were incorporated into Chomsky's *Aspects of the Theory of Syntax* (1965). In its day this was an enormously influential model, the basis for an explosion of research and expounded in a wide variety of student textbooks – so much so that it became known as the **Standard Theory**.

The structure proposed by the theory is more overtly modular than before, with different types of rules gathered into 'components' related to each other as set out in Figure 5.

The PS rules (which look after particular basic syntactic relations and the distribution of lexical items in deep structures) and the lexicon (which contains category and subcategory information about lexical items) become the base component. A deep structure, which is the output of this component, is passed on the one hand to a semantic interpretation and on the other through the transformational rules to become a syntactic surface structure and subsequently a phonological form.

At the beginning of *Aspects of the Theory of Syntax*, Chomsky defines the task of linguistic theory as:



> to develop an account of linguistic universals that on the one hand will not be falsified by the actual diversity of languages and, on the other hand, will be sufficiently rich and explicit to account for the rapidity and uniformity of language learning and the remarkable complexity and range of the generative grammars that are the product of language learning.
> (Chomsky 1965: 27–8)

The research programme this defines focuses on the explanatory power of the grammar in so far as it bears on a set of questions related to the way grammar might reveal general properties of the human mind. What, if any, are the universal properties of language? What is the possible range of variation within human languages? What is the nature of the innate knowledge a child must bring to bear on the acquisition of language? How is grammar involved in adult language processing?

In the *Aspects of the Theory of Syntax* model, the answer to these questions seemed to lie in transformations, which is doubtless why the model was popularly referred to as TG (transformational grammar). More and more were proposed, and as the number rose they began to

raise a number of technical problems, so much so that within a few years it became apparent that the transformation was too powerful a tool and the transformation itself became a major source of difficulty. A typical dilemma, for example, was the question of whether transformations should be ordered, and if so by what principles. At the time, the matter spawned miles of print, but ordering eventually proved to be an internal difficulty created by the structure of the theory rather than anything to do with any property of language itself, and the mountain of technical literature is now only of historical interest. However, it should be said that, although this eventually proved to be an unfruitful line of research, the investigation was not in vain, because in the course of the research a quite extraordinary amount was discovered about the grammar of English and other languages, much of it still awaiting a satisfactory explanation.

A more serious problem concerned the explanatory power of the transformation itself. We have already observed that, although in *Syntactic Structures* Chomsky was very concerned to explore the mathematical properties of PS rules, little attention was devoted to the mathematical power of transformations. Once the mathematical properties of this kind of rule were explored, it became clear that a grammar with transformations has the formal properties of a **universal Turing machine** – in other words, they are such a powerful tool that they can explain nothing except that language can be described in terms of some set of rules. An obvious effect of this unwelcome result was to see whether the power of the transformational component could be constrained so that it could, after all, do some useful explanatory work. An early, and still influential, line of research was inaugurated by Ross (1968).

To illustrate what was at issue, consider the formation rules for questions. From the earliest days, transformational grammarians postulated that a ***wh*- interrogative sentence** is derived by a movement rule from a deep structure resembling that of the corresponding declarative. So, for example, and disregarding the inversion and the appearance of a form of *do*, a sentence like *What did Bertie give – to Catherine?* would be derived from a deep structure of the form *Bertie gave 'wh' to Catherine* (the dash in the derived sentence indicates the site from which the *wh*- word has been extracted). ***Wh- movement*** can also extract *wh*- words from within embedded sentences, and apparently from an unlimited depth: *What did Albert say Bertie gave – to Catherine?*, *What did Zeno declare that Albert had said that Bertie gave – to Catherine?*, and so forth. The rule is, however, not entirely unconstrained. For example, if the constituent sentence is itself interrogative, then extraction cannot take place: *Albert asked whether Bertie gave a book to Catherine*, but not **What did Albert ask whether Bertie gave – to Catherine?* In Ross's terms, certain constructions form **islands** (the example shows a *wh*- island) and the transformational rule must be restricted from extracting constituents from islands. **Island constraints** turn out both to be quite general and to occur in many languages. An obvious question, then, is this: are island constraints a property of universal grammar and, if so, how are they to be formulated? Investigations to discover the properties of islands gradually focused on the notion of **bounding**: an attempt to identify what configurations of constituents constitute a **barrier to movement**. We will return to this in the next section.

Another line of research suggested that a movement transformation should leave a **trace** of the moved constituent in the **extraction site**: in these terms, our example above would be: *What did Albert say Bertie gave 't' to Catherine?* The full implications of this proposal will become apparent in the next section. Immediately, we will observe that the proposal offers another way of constraining transformations: we can allow the rule to apply freely and then apply a set of **filters** to weed out ill-formed structures. So, for example, we could allow unrestricted movement (even out of islands) and then have a filter to detect illegal traces and mark offending sentences as ungrammatical. In other words, instead of constraining the operation of the transformation itself, we can scan the output of the operation to check its legality.

Yet another approach to restricting the power of transformations suggested that the range of operations they could perform should be severely limited. Emonds (1976) proposed a **structure-preserving constraint**. In essence, the proposal was that a transformation should be able

neither to create nor destroy structure (structure-preserving), but only to move lexical material around within already established structures. This entailed several radical innovations. First, no structure created by a transformation can be different from a structure that the PS rules themselves might create. Second, if lexical material is to move, there must be somewhere to move it to. Between them these constraints ensure that the deep structure must have some lexicalised nodes (to provide the material to move) and some empty nodes (to provide places for the lexical material to move to).

Consider the effect on the passive. The deep structure will have to look like this: *NP*(*empty*) – *was* – *hit* – *the ball* (*by* – *the man*), and a rule of NP movement will move the object NP, *the ball*, into the empty subject position. The surface structure will then be: *The ball* – *was* – *hit* – (*by the man*). At first blush this may all seem a little odd, but we shall see in the next section that the proposal has some interesting consequences.

One consequence we can immediately notice: there is a move away from highly abstract deep structures. In fact, deep and surface structures become almost mirrors of each other, differing substantially only in the distribution of lexical items. Indeed, given a structure-preserving constraint and traced movement rules, the deep structure can always be reconstructed from the surface structure – this was by no means the case in the early days after *Aspects of the Theory of Syntax*. A further consequence of this development was to force attention once more onto the nature of PS rules. A consequence of this was the development of a more restrictive theory of phrase structure known as X-bar syntax, which we turn to in the next section.

We have seen that one way of restricting the power of transformations is to constrain them. A more drastic way is, of course, to abolish them altogether. This was indeed the fate of many. A natural question follows: what happens to the generalisations that the transformation purported to capture? The answer was that many transformational operations transferred themselves from the grammar to the lexicon. In both *Syntactic Structures* and *Aspects of the Theory of Syntax*, the **lexicon** was more or less a word list, and a repository of exceptions. Gradually it came to have a more central role. It came to be seen that the kinds of operation that Lees (1960/1963) had proposed for nominalisations were ill sorted as syntactic operations and more appropriately considered as lexical rules, hence most appropriately situated in the lexicon itself. Furthermore, rules involving the redistribution of the arguments of the verb within a simple sentence also came to be seen as lexical rather than syntactic rules.

Consider, for example, the rule of **Dative movement**. This was supposed to relate pairs of sentences like *John gave a book to Mary* and *John gave Mary a book* – the transformation deleting *to* and moving the NP following it to a position immediately after the verb. The problem for this as a general transformation is that it is in fact heavily constrained: there are some verbs which permit the first form but not the second (**They transmitted the enemy propaganda*) and others that permit the second but not the first (**John asked a question to Mary*). The constraints appear to be lexical rather than grammatical and hence perhaps better situated in the lexicon than in the grammar. The appropriate lexical rule would state that, for appropriate verbs, if they occur in the environment 'NP1 – NP2 to NP3', they can also occur in the environment 'NP – NP3 NP2'.

Note that this line of argument can be extended to the passive: there are some verbs, like *resemble*, that do not typically occur in the passive, and others, like *rumour*, that hardly occur in the active. A lexical derivation for the passive would say in effect that appropriate verbs that occur in the environment 'NP1 – NP2' can also occur in the passive participle form in the environment 'NP was – NP2 (by NP1)'. This, of course, is the very structure I discussed above.

We have seen that in the years following *Aspects of the Theory of Syntax* the various modules of the grammar have developed into specialist components, each with a particular kind of rule and each dealing with a part of the derivation of a sentence: the phrase-structure component looks after particular basic syntactic relations and the distribution of lexical items in deep structure; the lexicon looks after word-formation rules; the transformational component is reduced so that the only substantial transformations left are very general movement operations, themselves heavily constrained.

Principles and parameters

Chomsky's (1981) *Lectures on Government and Binding*, and work which followed over the next few years, pulled these changes together into a model that is generally referred to under the label 'principles and parameters' (P&P). This model, which revisits the concerns of a 'universal grammar' outlined in the quotation from *Aspects of the Theory of Syntax* at the beginning of the previous section: that it should be able to accommodate the facts of any natural language, help towards an explanation of child language acquisition, etc., is often referred to as '**universal grammar**' (**UG**), and it is clearly more suitable for this purpose.

It is more modular than its predecessors, a sentence now being assigned a description at each of four levels of description. The levels are in many ways similar to those proposed in Standard Theory, and clearly develop from them, but their internal structure is further elaborated and the relationships between the levels (as shown in Figure 6) are rearranged.

The principal organisational difference is that, whereas in the Standard Theory the derivation bifurcated at D-structure – one path leading to a semantic interpretation and the other through the transformational component to a syntactic surface structure and thence to a phonetic form – this time the bifurcation into Logical and Phonetic form is at S-structure. Some of the reasons for this change will have become apparent in the preceding discussion.

The structures generated at the various levels are constrained by a set of theories (X-bar, Theta, Government, Binding, Bounding and Case), each of which is associated with one or more **principles**, which define syntactic relations and regulate the various levels and the relations between them, and a set of **parameters**, which define the range of variation a particular principle permits in different languages.

Structures are formulated as the familiar syntactic trees, the possible configurations being defined according to the principles of **X-bar theory**, which defines the nature and type of syntactic relationships in tree structures, and **theta theory**, which deals with the functional relationships between a predicate and its arguments. Both, as we shall see, are constrained by the lexicon.

The central notion of X-bar theory is that each of the major lexical categories (Noun, Verb, Preposition, Adjective) is a 'head' and will 'project' a phrasal node of the same category as itself (noun: noun phrase, verb: verb phrase, etc.). An ongoing question was whether other categories also projected phrasal categories – we shall see examples shortly. The phrasal category is the 'maximal projection' of the head. There may in addition be a number of intermediate categories. So, for example, English NPs have structures like that shown in Figure 7.

The noun *discussion* is the head. The PP *about linguistics* is its 'complement'; the *AP interesting* is an adjunct, modifying its sister N1, and the determiner *an* is the specifier of the phrase. (The AP and PP projections are not expanded here for reasons of space.) Complement is an important relationship for several reasons. Heads are 'subcategorised' by their complements – a relationship most clearly seen with verb heads (intransitive verbs (*John laughed)* have no complement, transitive verbs (*John kicked the ball*) must have an NP complement, di-transitive verbs (*John gave Mary a ball*) have two NP complements and so on) and sub-categorisation of this kind can readily be applied to the other major categories.

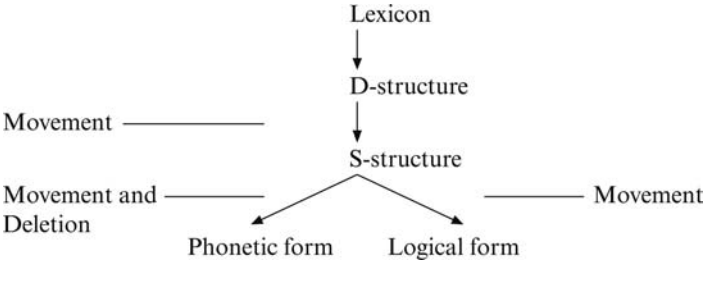


Figure 6

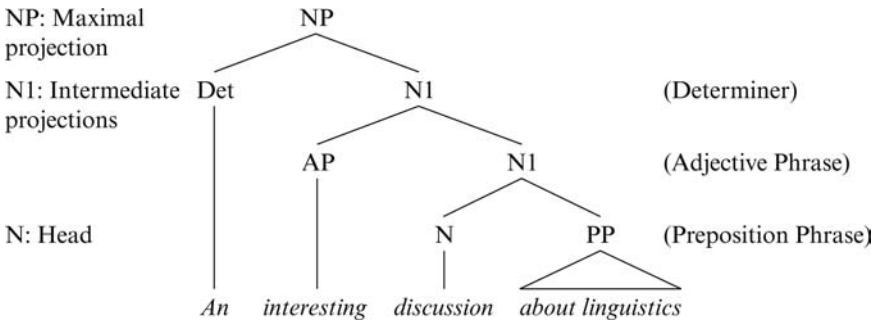


Figure 7

Sub-categorisation information of this sort is, of course, recorded in the lexicon. We can use this relationship to define the grammatical relation 'Object of the verb': it is an NP complement. (The relation 'Subject of the sentence' we come to below.) Furthermore, heads assign a theta role to their complements, a notion that will be explicated when we discuss theta theory below. In X-bar trees, complements are represented as sisters of the head dominated by the intermediate category X1 (read as 'X bar') – X1 can be thought of as a constituent that is intermediate between the head and the phrase. **Specifier** is also an important relationship since it is the locus for grammatical categories characteristic of the phrase in question – in the NP determiners, articles and the like – and frequently it must agree in number with the head (cf. *this* (sg) *man* (sg); *these* (pl) *men* (pl)). In X-bar trees specifiers are represented as daughters of the head and sisters to an X1. Adjuncts are daughters of an X1 and sisters of another X1; adjuncts in the NP are adjectives, relative clauses and similar modifiers; in the VP, they are adverbs. These observations could be formulated as a set of principles: the head projects an X1, which may also dominate a phrasal category as complement, and so on.

These principles can also be applied to the D-structure of the sentence itself. This is illustrated in outline in Figure 8 (for reasons of space, details of several of the phrasal projections are suppressed, including X1 categories not relevant to the argument).

We can use the figure to ask this question: if the noun is the head of the noun phrase, the verb of the verb phrase, etc., what is the head of the sentence? P&P offers two answers. One answer is that the head is a marker of the 'mood' status of the sentence, whether it is declarative, interrogative, etc. In simple declarative sentences there is, of course, no mood marker in English, but it is argued that the 'complementiser' *that* which occurs in embedded declaratives, as in *I think [* ***that*** *the cat caught the mouse]* is in fact an overt declarative marker, just as the complementiser *whether* is an interrogative marker: *I wonder [* ***whether*** *the cat caught the mouse]*. Now if the complementiser is a head, we may suppose that, like other heads, it projects a phrasal category, let us call it CP. Suppose, finally, that simple declarative sentences have an abstract marker of their mood status, then we can have a representation like that of Figure 8. A further advantage is now that the Specifier of the C node can serve as the landing site for fronted *wh*-words in interrogative sentences (*What did the cat catch?*) and the fronted *wh*- word certainly seems

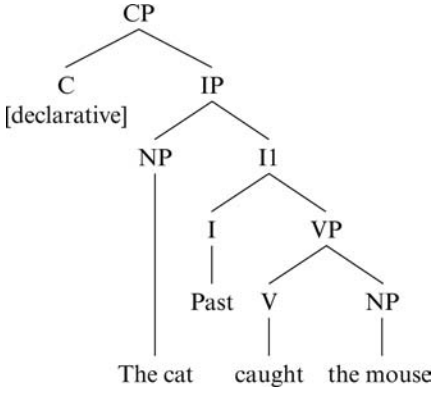


Figure 8

to be an overt marker of interrogative mood. The second answer is that the head is the tense marker, and a tense marker is obligatory in simple sentences. If we call the category of the tense marker I or Infl (for Inflection – and tense is characteristically marked as an inflection of some kind on the first verb in the verb group), then it too will project a phrasal category, this time IP. This analysis too is shown in Figure 8. Note that we can use this configuration to define the grammatical relation 'Subject of the sentence': it is the NP that is specifier of the IP. We noted earlier that the Specifier node is the locus for grammatical information for its particular phrasal projection; here we have seen the SpecC as the site for fronted *wh-* words, and SpecI as the grammatical subject.

In the initial section we noted that PS grammars captured relations of constituency (or dominance) and order. X-bar theory captures notions of dominance and in addition gives a configurationally definition to the relationships outlined in the previous paragraph – it can be argued that such relations are indeed universal. It does not, however, determine the order of constituents, which is well known to vary from language to language: in English adjectives usually precede their noun heads, in French they typically follow; in the English VP the verb is followed by its complements, English is a SVO language [*see* LINGUISTIC TYPOLOGY]; in Japanese the complements precede the verb, Japanese is a SOV language. In both languages order is defined with respect to the head. These variations between languages are handled by the **word order parameter**. The way the parameter is set for any particular language is then an empirical matter for the language learner (head first in Japanese; head last in English). What the X-bar principles do is define constituency and dominance; what the parameter does is define the range of permissible word order variations. A particular language can be thought of as choosing some position in the **syntactic space** defined by the interaction of the principles and the parameter.

Before turning to theta theory, we should note the pivotal role in all this of the lexicon. As we have seen, information on sub-categorisation is associated with items in the lexicon. It will record that, say, CATCH is a transitive verb, and it might do so in an entry which contained, *inter alia*, information like this: CATCH; V; – NP (i.e. that CATCH is a verb and that it occurs with an NP sister). There is now a real sense in which, given this lexical information and the X-bar principles enunciated above, CATCH can 'project' the relevant partial structure shown in Figure 8. Lexical items will also have semantic information, for our immediate purposes, in the case of a verb, some account of its 'predicate argument' structure (the verb being the predicate and its subject, object, etc. its arguments). For CATCH, we need to know that it is associated with an agent as subject ('the catcher') and a patient as object ('the caught').

Theta theory is concerned with predicate argument structure: a predicate is said to take the relevant information from the lexicon and assign a theta role to each of its syntactic arguments. One of the principles associated with theta theory is the **theta criterion**: this says that each argument of the verb receives one and only one theta role and each theta role is assigned to one and only one argument. The theta criterion thus ensures that a verb will be associated with just the right number of lexical arguments. So, for example, with CATCH the theta criterion will ensure that it occurs with two lexical NPs and that **agent** and **patient** are assigned correctly to its subject and object. A further principle of theta theory is the **Projection principle**: the theta-marking properties of a lexical item must be represented, or projected, at each syntactic level: D-structure, S-structure and logical form. This has a number of profound effects. One is that there can be no rules deleting or inserting items that have a semantic interpretation – in effect, transformations will be limited to movement rules. A second is that the D-structure will have the possibility of generating NP nodes that are unfilled by lexical material and these will provide 'landing sites' for movement rules, in accordance with the structure-preserving principle introduced at the end of the previous section. Suppose, for example, that we derive the passive, as suggested at the end of the previous section, from a deep structure of the form 'NP1 – was – Passive Participle – NP2 (by NP3)'. Theta theory will ensure that the verb assigns at a maximum two theta roles – patient to NP2, and agent (if it is chosen)

to NP3 – and so only two of the NPs can be lexicalised. In a passive sentence, NP1 will receive no theta role, but will be the site for the patient NP to move to – how and why it does that, we will come to.

As a further example, consider a verb like SEEM. The lexicon must record that SEEM has a proposition, a sentence, as an argument but is associated with no lexical NP arguments and so assigns no theta roles. In a sentence like *It seems that the cat caught the mouse*, the lexical NPs (*cat* and *mouse*) receive their theta roles from CATCH in the subordinate clause. What then of *it?* The traditional description would have it as a **dummy** subject: dummy because it has no semantics (you cannot, for example, ask *What seems that the cat caught the mouse?*), which we can interpret as having no theta relation to SEEM. The deep structure will then have the general form shown in Figure 9(a):

a D-structure: ($_s$ e + tns seem ($_s$ that the cat + tns catch the mouse))
(dummy *it* inserted as subject of *seem*)
b S-structure: ($_s$ it + tns seem ($_s$ that the cat + tns catch the mouse))
c LF: (seem, (catch (the cat, the mouse))
d PF: It seemed that the cat caught the mouse

Figure 9

By the theta criterion, the subject of SEEM cannot be a lexical NP but both the subject and object of CATCH must be lexical. *It* will be supplied between D- and S-structure. *It* is supplied because English sentences require tensed verbs (shown by the marking '+ tns') to have grammatical subjects; how this comes about we will discover when we turn to case theory shortly. The Projection principle ensures that the theta properties of predicates are projected at each syntactic level: D-structure, S-structure (9b) and logical form. In the schematic representation, a form of predicate calculus (which should be self-explanatory) is used to represent the logical form.

I will discuss another example involving SEEM below.

At this point we should return to examine transformations again. As before, D-structure provides a structural description of a sentence. D-structure is related to S-structure by transformation, as are PF and LF to S-structure. The notion of transformation is, however, much restricted. Between D- and S-structure, and between S-structure and LF, the theta criterion and the Projection principle forbid the insertion or deletion of meaningful elements. This means we are left with only Movement transformations, and this is expressed as the extremely general rule 'move alpha' – in essence, 'move anything'. This may seem to be an extraordinarily relaxed approach to movement, but it is in reality severely controlled by the various sub-theories. In effect, movement is restricted to lexical material moving from one node to another (empty) node, leaving an empty category behind marked with a trace, to which it is 'bound' (i.e. co-referential, shown by marking with the same subscript). Movement rules have the potential for moving an item very far from its deep structure position: *[What$_i$ [t_i was caught t_i by the cat]]: [What$_i$ [did you say [t_i [t_i was caught t_i by the cat]]]]*. However, movement is in fact constrained by the fact that an item and its immediate trace cannot be too far away and, as we saw from the discussion of 'islands' in the previous section, there are some boundaries that cannot be crossed at all. Movements like this are **chained**. A chain will show where an item started its journey, where it finished its journey, and all its intermediate stopping places and all these positions will be subject to checking. **Bounding theory** defines these restrictions.

Central to all these sub-theories is **Government theory** (note that 'Government' is part of the title of Chomsky's 1981 book with which we began this section). Government involves the relationship between a governor and a governed. The governor controls the governed, a relationship that can, but need not, be overtly marked by the morphology. The notion is an old one – in traditional grammar verbs and prepositions were said to govern their complements in a particular case. In English, they govern object pronouns in the objective case: *saw me (*I); to me (*I)*. The relationship can be given a configurational definition: within a maximal projection a head will govern its complement. In P&P the definition is extended so that it covers other relationships we have thus far considered, and will come to later, in more detail. It is

extended to cover the relationship between a specifier and its head: this will subsume many agreement phenomena, as, for example, subject–verb agreement: in Figure 8, the head, I(nfl), the tensed inflection, can be defined to govern its specifier, the subject NP, in the nominative case (*I (*me) saw the mouse*). In theta theory, which we looked at earlier, theta assignors will govern the items to which they assign theta roles. Government can also be extended to regulate movement rules in that it is defined to cover the distribution of traces, formalised by the '**empty category principle**', which declares that all traces must be properly governed, and the '**minimality condition**', which restricts the distance between a governor and what it governs.

Government is also central to **Case theory**. This regulates the distribution of phonetically realised NPs by assigning **abstract case** to them. **Case** is assigned by a set of **case assignors** to the constituents they govern. We have assumed that V, Prep and Infl(+ tns) are case assignors: Infl(+ tns) assigning nominative case to the NP it governs (the subject, reflecting the fact that tensed sentences require subject expressions); V assigning oblique case to the NP it governs (the object) and Prep also assigning oblique case to the NP it governs. These definitions can now be associated with a **Case filter**, a checking device that will declare a sentence to be ungrammatical if it contains an NP containing phonetic material but assigned no case or, vice versa, an empty NP which is assigned case but contains no phonetic material. In effect, case theory will require, *inter alia*, the positions of grammatical subject in a finite sentence and object to be filled with lexical material. The phrase **phonetic material** is used to cover not only lexical NPs but also items like the dummy *it* associated with *seems*. The reader is invited to check this with the derivations shown in outline in Figure 9.

We are now in a position to sharpen up our notions of D-structure, S-structure and the relationship between them: **D-structure** is the level at which theta positions must be filled by lexical material. At this level verbs must be associated with the correct number of arguments: if active *catch* is associated with fewer than two NPs, or if *seem* is associated with any NP, then the theta criterion will rule the structure as ill formed. Transformations may then move material into empty nodes, and in appropriate cases a dummy *it* will be supplied. Case theory will then check the final distribution of lexical items, both moved and unmoved, and if material is found where it ought not to be, or if there is no material where some should be, the sentence will be marked as ill formed.

The matter can be illustrated by another example involving *seem*. Consider the sentence *The cat seemed to catch the mouse*. If we are to be consistent with our own account of theta theory, the distribution of lexical material in the D-structure and the logical form assigned to the sentence must be the same as that assigned to *It seemed that the cat caught the mouse*, shown in Figure 9. These similarities are recorded in the derivation shown in Figure 10:

a D-structure: ($_s$ e + tns seem ($_s$ the cat – tns catch the mouse))
(move the cat into the empty subject position)
b S-structure: ($_s$ the cat$_1$ + tns seem ($_s$ e$'_1$ – tns catch the mouse))
c LF: (seem, (catch (the cat, the mouse))
d PF: The cat seemed 'e' to catch the mouse

Figure 10

The differences between the two sentences are due to the fact that the constituent sentence in our first example is finite and tensed (*that the cat caught the mouse*), whereas in the second sentence it is non-finite, and hence untensed (*to catch the mouse*): this difference is recorded in the D-structure below by the notation + tns (finite, tensed) or – tns (non-finite, untensed). We saw above that + tns was a governing category and governed an NP in the nominative case: suppose now that – tns is not a governor; as such, it will not assign case: this reflects the traditional view that infinitives cannot have subjects. Now, according to the theory, lexical material must be given case: this it can only acquire by moving into the position of subject of *seem* where, being governed by + tns, it will, as required, acquire case. Move alpha produces a situation where the chain created by movement will, as required, ensure that the chain with the lexical NP *the cat* has one theta role (*the cat* is assigned agent as subject of *catch:* the subject of

seem has no theta role) and one case (*the cat* acquires nom(inative) case from + tns in the main clause, but no case from – tns in the constituent clause). Similarly, the lexical NP *the mouse* gets oblique case as object of *catch* and is assigned the theta role of theme. The reader is invited to work out why strings like **It seemed the cat to catch the dog*, **The cat seemed caught the dog*, etc. are ill formed.

Binding theory is concerned with the syntactic domains in which NPs can or cannot be construed as coreferential. If we suppose that all NPs are assigned a **referential index**, then **coreference** can be shown by marking NPs with the same index and **noncoreference** by marking them with different indices. An NP with an index distinct from all other NPs is said to be **free**; an NP which has the same index as another is said to be **bound**. An NP must be either free or bound within a particular **domain**. Thus, for example, in *John*$_1$ *likes himself*$_1$, the reflexive pronoun, *himself*, must be bound by some other NP within its domain, in this case the subject NP *John* – this is shown in the subscripting. In *John*$_1$ *likes Mary*$_2$, the full lexical NPs *John* and *Mary* cannot be coreferential, and this is shown by assigning them different indices. The relevant domain for the binding of reflexive pronouns in English is, informally speaking, the simple sentence, but different languages are able to select domains differently. Binding theory is concerned with the categories that must be bound and free and with defining the domain in which binding takes place; another area of grammar in which languages differ or, in terms of government and binding (GB) theory, set their **parameters** differentially.

We appear to have come a long way from *Syntactic Structures*, and in some senses this is indeed the case. In others, however, the thirty-four years since its publication have shown a remarkably consistent purpose. Details of grammatical organisation have clearly changed and developed and the general architecture of the theory has changed. But in many ways the goals set out in the first sentences of the introduction to *Syntactic Structures* remain (Chomsky 1957: 11). Universal grammar, child language acquisition and language understanding still motivate the investigation, but the machinery is now more subtly adapted to the task since there are now many interacting components, each of which can be fine-tuned.

The minimalist program

In a series of papers from the late 1980s Chomsky returned to re-examine some of the fundamental principles of generative grammar. We shall look at two: the first is the recurrent issue of the number and nature of the levels of representation, the relationships between them and the way these levels are justified; the second is the nature of the rules required in a derivation. The two issues are, as always, intertwined.

We have seen that the levels of representation identified in the P&P model and the relationship between them are as shown in Figure 6. The levels and the relationships between them proposed in minimalism are shown in Figure 11.

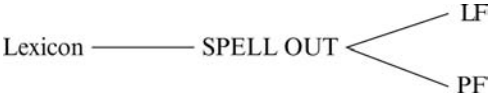


Figure 11

LF and PF remain, but DS and SS disappear: we will return to SPELL OUT below. The claim is that LF and PF can be 'externally motivated': they are the 'interfaces' between, respectively, the cognitive systems relating to language production and understanding, and the articulation/auditory production systems. By contrast, DS and SS could only be motivated by considerations purely internal to the linguistic model and hence have no psychological reality or justification.

For reasons of space we shall concern ourselves only with LF (although the kind of issues we will look at apply *pari passu* to PF) and will concentrate on 'grammatical' categories, like tense, number, gender, case and the like.

Let us first return to Figure 11. In P&P, a D-structure is constructed according to the lexical properties of particular items, constrained by the structures that are permitted by the principles of X-bar theory. Suppose, however, that we were to construct an analysis tree simply by selecting items randomly from the lexicon and seeing if they 'fit together' or merge to form a larger item,

either because of lexical properties of their own or because of general principles governing the merge operation. Suppose, for example, a random selection from the lexicon produced the words *into*, *sing* and *cats;* there is no way these could merge successfully to produce a well-formed sentence and consequently at SPELL OUT a derivation would 'crash'. On the other hand, suppose we selected *he*, *is* and *singing:* the lexical properties of the progressive auxiliary form of BE requires it to have an *-ing* verb form as its complement and those of SING allow it to be used intransitively. These properties allow *is* and *singing* to merge successfully. A general property of Merge requires a tensed verb, like *is*, to have a subject with which it agrees in number: *he* satisfies these requirements so *he* can merge with *is singing* and be spelled out as the acceptable sentence *he is singing*.

To see in a bit more detail what is involved, let us suppose our example sentence has an analysis as in Figure 12. In the discussion we will largely follow the representation developed in Radford (1997).

As we have assumed, each of the words is characterised in the lexicon as belonging to a particular lexeme: *is* is a form of BE, for example, and each is characterised by a set of features representing the 'grammatical categories' of the word concerned (there will also, of course, be information about the sense of the item concerned, its pronunciation and so on, but we are not concerning ourselves with these here). In Figure 12 the features are divided into three subsets. Head features are those particularly important for the interpretation of the word form concerned: *he* is the third person singular masculine, nominative (subject) form of the pronoun; *is* is the present progressive form of the verb BE, and *singing* is the present participle (*-ing*) form of the verb SING. Complement features indicate the form of the constituent which is to be the complement of the item in question: progressive BE requires to be followed by the present participle, so BE is marked with the complement feature [+ ing]; SING here is intransitive and has no complement. Specifier features indicate agreement properties: English requires a tensed verb to agree in person and number with its subject, which must furthermore be in the nominative case if it is a pronoun. In the discussion of Figure 8 in the last section we identified the subject of the sentence as the specifier of the relevant IP. In Figure 12 this means that HE (the IP specifier) must agree with BE (the tensed verb).

Now, some of the features in Figure 12 contribute to the semantic interpretation of the sentence: we need to know that *he* is the third person masculine singular form of the pronoun (as opposed to, say, *she* or *they*); and *is* is the present progressive form of BE (as opposed to, say, the past form *was*). Features of this kind are 'interpretable' to LF in the sense that they contribute to the semantic interpretation, and hence can be externally motivated: if we had any of the other forms in brackets in the previous sentence, we would have a different interpretation (*she was singing*, say). To distinguish them, interpretable features are emboldened in

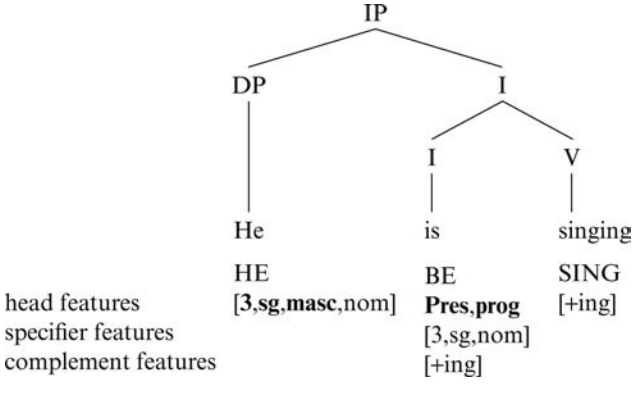


Figure 12

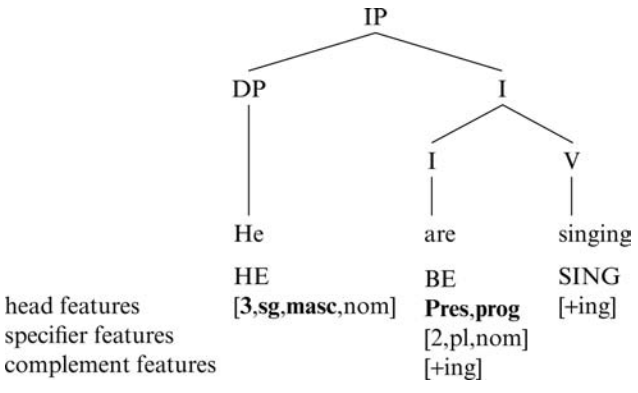


Figure 13

Figure 12. By contrast, the other features – while they are clearly necessary for grammatical well-formedness – do not contribute to semantic interpretation. Thus, for example, the agreement features on *is* merely reflect the relevant features of the subject and do not themselves add to the interpretation; similarly, the fact that SING is in the present participle form is a formal consequence of its being the complement of BE and contributes nothing to the interpretation. Neither **She be singing* nor **he is sing* are well formed in Standard English and, in so far as they are comprehensible, they do not have different semantic interpretations from the example sentence. Features of this kind then are not 'interpretable'. The claim is that, since LF interfaces with the cognitive system, it should contain only interpretable features – this is formulated as the '**principle of full interpretation**'.

Now, if LF is to have only interpretable features, then we must have a derivation whereby the uninterpretable features necessary for grammatical well-formedness are eliminated in the process of derivation, leaving only the interpretable features to reach LF. This is done by a process of 'checking': items are examined pair by pair and uninterpretable features are eliminated if they can be checked off against a matching feature. If the matching feature is interpretable, then it will remain and the uninterpretable feature is eliminated; if both are uninterpretable, then both will be eliminated. Applied to our example, this will yield (Table 1):

Table 1

	HE	BE	SING
head features	[**3,sg, masc**, ~~nom~~]	**Pres,prog**	[+~~ing~~]
specifier features		[~~3,sg,nom~~]	
complement features		[+~~ing~~]	

Since this contains only interpretable features the derivation survives after SPELL OUT. By contrast, a structure like that shown in Figure 13 will, after checking, yield (Table 2):

Table 2

	HE	BE	SING
head features	[**3,sg, masc**, ~~nom~~]	**Pres,prog**	[+~~ing~~]
specifier features		[2,pl,~~nom~~]	
complement features		[+~~ing~~]	

This derivation contains uninterpretable features; consequently, following the principle of full interpretation, it will 'crash' at SPELL OUT.

We started this section by observing that DS and SS disappear, and it can now be seen how

this is so. The structure in Figure 12 derives from selecting and merging lexical items: unlike a D-structure, it has no particular status with respect to semantic interpretation, grammatical well-formedness or the like. **SPELL OUT** is not like SS: in Principles and Parameters **SS** is a level at which certain properties are determined (typically, case assignment or binding, or both), by contrast, SPELL OUT is not a level but a procedure that can in principle occur at any stage in a derivation, and will either lead to a successful derivation or to a derivation crashing. The discussion also casts some light on the second issue raised at the beginning of this section – the nature of the rules required in a derivation. We have only had the space to examine a few simple sentences: more complex sentences will require the familiar movement rules, but this time, instead of constraining them by a web of general restrictions, they will be constrained by highly local configurational considerations. The intention is to make the grammatical machinery as spare (minimal) as possible and only use that which can be justified as required by the nature of the cognitive systems that are under investigation.

E. K. B.

Suggestions for further reading

Freidin, R. (2006) 'Principles and Parameters Framework of Generative Grammar', in Keith Brown (ed.), *Encyclopedia of Language and Linguistics*, 2nd edn, Oxford: Elsevier, Vol. X, pp. 94–102.

Lasnik, H. (2006) 'Minimalism', in E. Keith Brown (ed.), *Encyclopedia of Language and Linguistics*, 2nd edn, Oxford: Elsevier, Vol. VIII, pp. 149–56.

Radford, A. (1988) *Transformational Grammar*, Cambridge: Cambridge University Press. (A student's introduction to P&P.)

— (1997) *Syntactic Theory and the Structure of English: A Minimalist Approach*, Cambridge: Cambridge University Press. (A student's introduction to the Minimalist Program.)

Generative phonology

Introduction

Generative phonology (GP) is the theory, or theories, of phonology adopted within the framework of generative grammar [*see* GENERATIVE GRAMMAR]. Originating in the late 1950s, principally in work by Halle and Chomsky (Chomsky et al. 1956; Halle 1959), it developed during the 1960s to reach a standard form in Chomsky and Halle's *The Sound Pattern of English* (1968) (SPE). Much of the work in the 1970s derived from SPE in an attempt to overcome the difficulties posed by this framework, and by the late 1970s the theory had fragmented into a number of competing models. The 1980s saw more of a consensus, particularly with the development of **non-linear** phonology, while the rise, in the 1990s, of **optimality theory** [*see* OPTIMALITY THEORY], offered a new paradigm which, according to many phonologists, has superseded the GP model.

The standard model

The SPE model of phonology adopts the framework of the 'standard theory' of generative grammar of Chomsky (1965), in which a central syntactic component enumerates abstract 'deep' structures which underlie the meaning, and which are related to actual 'surface' structures by means of transformations. Within this model, the role of the phonological component is to interpret such surface structures, assigning to them an appropriate pronunciation, and thus accounting for the speaker's competence in this area of the language.

The surface structures which constitute the input to the phonological rules are represented as a string of 'formatives' (morphemes) and a labelled syntactic bracketing. The phonological rules convert such a structure into a phonetic representation expressed in terms of a universal set of phonetic features.

In addition to phonological rules, we require a **lexicon**, a listing of those features of the formatives, including phonological attributes, which are not derivable by rule. Since formatives are subject to a variety of phonological processes in specific contexts, their lexical representation must be in the most general form from which the individual realisations can be derived. It will thus be morphophonemic [*see* MORPHOLOGY]. For example, the German words *Rad* and *Rat*, both pronounced [ra:t], will have different lexical representations, since inflected forms such

as *Rades* [ra:dəs] and *Rates* [ra:təs] are pronounced differently. In this case *Rad* can be given a lexical representation with a final /d/, since the [t] is derivable by general rule.

Although the segments of lexical representations are comparable to morphophonemes, Halle (1959, 1962) demonstrated that there is not necessarily any intermediate level, corresponding to the phoneme, between such representations and the phonetic representation. Thus in Russian there are pairs of voiced and voiceless 'obstruent' phonemes, i.e. plosives, affricates, and fricatives, and voiceless obstruents are regularly replaced by voiced ones when followed by a voiced obstruent; thus [mok l, ɨ], but [mog bɨ]. The same rule applies to /ʧ/ – [doʧli] but [doʤbi] though [ʤ] is not phonemically different from [ʧ]. This rule is a single process, but to incorporate a phonemic level would involve breaking it into two, since it would need to apply both to derive the phonemes and to derive the allophones. Hence the phoneme has no place in the GP framework; phonemic transcriptions are, according to Chomsky and Halle, merely 'regularised phonetic representations', while 'complementary distribution', the fundamental criterion of phonemic analysis, is 'devoid of any theoretical significance' (Chomsky 1964: 93).

Since the lexical representation is intended to contain only non-predictable information, it will take the form of redundancy-free feature matrices in which predictable features are unspecified. Since, however, redundant features may be required for the operation of phonological rules, these features must be inserted by a set of conventions, **redundancy rules** or **morpheme structure rules**, which express in indirect form the constraints on segment types and morpheme structures in the language concerned. These rules, together with rules to eliminate superfluous structure, etc. are called **readjustment rules**, and they will apply before the application of the phonological rules proper.

The rules of the phonological component thus operate on fully specified feature matrices constituting the **phonological**, or **underlying**, representation. These rules are of the form A → B/ C – D where A is the feature matrix of the affected segment(s), and B the resulting matrix; C and D represent the context – being the position of the affected segment(s) A. In the standard theory these rules are in part ordered so as to apply in a fixed sequence. Thus, from English /k/ we can derive [s] and [ʃ]: *electric* [k], *electricity* [s], and *electrician* [ʃ]; but since [ʃ] is also derived from [s] in e.g., *racial*, cf. *race*, the [ʃ] of *electrician* is best derived by two ordered rules: /k/ → [s], [s] → [ʃ].

The application of rules may be constrained by grammatical factors. Thus the rules for English stress depend on whether the word is a noun or a verb: ˈ*import v.* *imˈport*, while the realisation of German /x/ as [x] or [ç] in words such as *Kuchen* [ku:xən] ('cake') and *Kuhchen* [ku:çən] ('little cow') depends on the morphological structure of the words, which can be represented as /ku:xən/ and /ku: + xən/, respectively. There is therefore no need for the phonemic 'separation of levels', nor for 'juncture phonemes' [*see* PHONEMICS].

A special case of the relationship between syntax and phonology is the **cyclical application of rules**, where some sets of rules may reapply to progressively larger morphological or syntactic domains. In the description of English stress, which takes up a large part of SPE, the different stress patterns of *blackboard eraser* and *black board-eraser* follow the cyclical application of the stress rules. If these expressions have different structures, with different bracketing of constituents, then a cyclical procedure whereby rules apply within the brackets, after which the innermost brackets are deleted and the rules apply again, will achieve the desired results. On each cycle, primary stress is assigned, automatically reducing other levels by 1 (Table 1).

The rules are intended to capture significant generalisations, and a measure of this is the simplicity of the rules themselves. In a number of cases special formal devices are necessary to ensure that more general rules are also simpler. For example, assimilation is a very general process in which feature values of adjacent segments agree, but this would normally involve listing all combinations of features in the rules, e.g.:

$$[\text{syll}] \rightarrow \left\{ \begin{array}{c} \begin{bmatrix} +\text{ant} \\ -\text{cor} \end{bmatrix} / \underline{\quad} \begin{bmatrix} +\text{ant} \\ -\text{cor} \end{bmatrix} \\ \begin{bmatrix} +\text{ant} \\ +\text{cor} \end{bmatrix} / \underline{\quad} \begin{bmatrix} +\text{ant} \\ +\text{cor} \end{bmatrix} \\ \text{etc.} \end{array} \right\}$$

Table 1

	[[[black]	[board]]	[eraser]]
Cycle 1	[1]	[1]	[1]
Cycle 2	[1	2]	–
Cycle 3	[1	3	2]
	[[black]	[[board]	[eraser]]]
Cycle 1	[1]	[1]	[1]
Cycle 2	–	[1	2]
Cycle 3	[2	1	3]

A simpler statement can be achieved by using 'Greek letter variables', e.g., [αanterior], where 'α' must have the same value ('+' or 'minus') for the two segments involved, e.g.:

$$[\text{syll}] \rightarrow \begin{bmatrix} \alpha\text{ant} \\ \beta\text{cor} \end{bmatrix} / \_\_\_\_\_ \begin{bmatrix} \alpha\text{ant} \\ \beta\text{cor} \end{bmatrix}$$

Problems and solutions

The SPE framework offered a new and often insightful way of describing phonological phenomena, and it was applied to a variety of languages. But it became clear that unconstrained application of the above principles can lead to excessively abstract phonological representations and insufficiently motivated rules. Consider the description of nasalisation in French (Schane 1968). French nasal vowels can be derived from non-nasal vowels followed by nasal consonants: /bɔn/ → [bɔ̃]; this process, involving a nasalisation rule followed by a nasal consonant deletion rule, applies in final position and before a consonant, but not before vowels, e.g., *ami* [ami] – or in the feminine, e.g., *bonne* [bɔn]. If we assume that feminine forms have an underlying /ə/, i.e. /bɔnə/, which prevents the application of the nasalisation rules, followed by a further rule deleting the [ə], then the feminine is no longer an exception, and the rules can apply more generally.

Thus the application of rules can be manipulated by means of a suitably abstract phonological representation, in which segments are included whose sole purpose is to prevent or facilitate the application of rules. This procedure can easily be abused to give underlying forms which, though apparently well motivated in terms of formal adequacy, may be counterintuitive and quite spurious. For example, the rules of SPE predict that stress will not fall on the final syllable of an English verb if it contains a lax or short vowel followed by only a single consonant. The word *caress* [kəˈres] appears to be an exception, but it can be made regular with a phonological representation containing a double final consonant, and with a rule of **degemination** to eliminate the superfluous consonant after the stress rules have applied. Similar considerations motivate representations such as /eklipse/ and /giraffe/. The problem is not that such representations are necessarily incorrect – though most generative phonologists assumed that they are – but rather that the theory offers no way of distinguishing between legitimate and illegitimate abstractions in such representations.

Many different proposals were made to solve these problems, and to reduce the arbitrariness and abstractness of phonological representations and rules. Chomsky and Halle themselves (1968: Chapter 9) proposed the use of **universal marking conventions** to maximise naturalness of segments. Under their proposal, feature values in lexical representations may be in terms of 'u' (unmarked) and 'm' (marked) instead of '+' and '-', these being interpreted as '+' or '-' according to universal principles. However, this approach found little favour. Other proposals involve constraints on underlying representations or rules, but the problem with all such proposals is that they tend to be too strong, ruling out legitimate as well as illegitimate abstractions.

For example, to avoid underlying forms which are too remote from phonetic reality, we might propose that the underlying form of a formative should be identical with the alternant which appears in isolation. But this is clearly unsatisfactory, since the forms of German *Rat* and *Rad* cited above can only be predicted from the inflected stem. Or we might require the underlying form to be identical with one of its phonetic manifestations; however, none of the stems of, for example, the set of words *photograph*, *photography*, and *photographic* could serve as the underlying form of the others, since all have reduced vowels from which the full vowels of the others cannot be predicted. Similarly, constraints have been proposed on **absolute neutralisation**, in which an underlying contrast is posited

which is never manifested on the surface, and on the use of phonological features, such as the double consonants of the above English examples, merely to 'trigger' or to inhibit the appropriate rules. But again, cases have been adduced where such devices seem justified. Thus all the proposals suffer from the drawback that they are often as arbitrary as the phenomena they purport to eliminate.

Another factor contributing to the power of generative phonology is **rule ordering**. Ordering relations among rules are either **intrinsic**, that is, dictated by the form of the rules themselves, or **extrinsic**, that is, specifically imposed on the grammar. The latter fall into a number of types. In view of the power that ordering gives to the grammar, some phonologists sought to impose restrictions on permissible orderings, and some, e.g., Koutsoudas et al. (1974), argued for the complete prohibition of extrinsic ordering, requiring all rules to be either intrinsically ordered or to apply simultaneously.

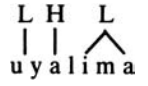
By the late 1970s, some of these principles had been included in a range of alternative theories (see Dinnsen 1979) which claimed to overcome the difficulties posed by the SPE framework, particularly by imposing a variety of constraints on phonological representations, rules or rule ordering. An important requirement made by a number of phonologists was that phonological descriptions must not only provide adequate descriptions, but must also be **natural**, and some theories explicitly adopted the label **Natural Phonology**. The theory of Stampe (1969, 1973; cf. Donegan and Stampe 1979), for example, argues that speakers of all languages are susceptible to universal **natural processes**, for example rules of assimilation or word-final devoicing, which will thus form a part of the grammars of all languages, unless speakers learn to suppress them. The problem here is to determine which rules belong to this category. The theory of **Natural Generative Phonology** of Vennemann and Hooper (see Hooper 1976) is perhaps the most constrained of all, disallowing all non-intrinsic ordering and imposing further restrictions such as the **true generalisation condition**, which prohibits the positing of any phonological rule which is apparently contradicted by surface forms. There could not, for example, be a rule voicing intervocalic consonants if voiceless consonants can occur intervocalically in phonetic forms of the language.

Non-linear phonology

Although these various alternative theories claimed to offer solutions to the problems of the SPE framework, and a number of them won a following, the 1980s saw the rise of a new trend, eclipsing most of the proposals and providing a set of more unified approaches. This new orientation addressed another weakness of SPE generative phonology: its linearity.

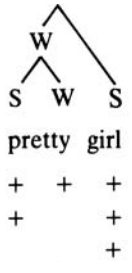
In the SPE framework, the phonological representation of a sentence takes the form of a linear sequence of segments and boundaries. The boundaries reflect a hierarchical syntactic structure, but the phonological segments themselves are in purely linear order. Although many phonological rules can be adequately stated in terms of such an order, a linear representation is less appropriate for **suprasegmental** features such as stress and tone. Two influential approaches which adopt a more structured, non-linear approach are autosegmental phonology and metrical phonology.

Autosegmental phonology (Goldsmith 1976) began as a theory of tone. In the SPE framework, the purely segmental representations, which do not even recognise the syllable as a unit, imply that tones are specified as features of vowels. This becomes difficult, however, if, as in some approaches, **contour** tones, i.e. rises and falls, are regarded as sequences of pitch levels, since two successive features must be assigned to the same vowel. Furthermore, in many tone languages, particularly those of Africa, the number of tones is not always the same as the number of vowels, since more than one tone may occur on a given syllable, and tones may 'spread' to adjacent syllables [*see* TONE LANGUAGES]. This is solved in the autosegmental framework by regarding the tones not as features of the vowels but as a separate, autonomous level, or **tier** of representation, related to the segments by rules of **association**, e.g.:



A universal set of **well-formedness conditions** is proposed to determine the permissible associations, as well as rules which operate on the tonal tier itself. In later work, other phenomena, such as vowel harmony (Clements 1976) and nasalisation (e.g., Hyman 1982), were given a similar treatment.

Metrical phonology began as an interpretation of the stress rules of the SPE framework (see Liberman 1975; Liberman and Prince 1977), in which it was shown that the various stress levels could be derived from a hierarchically ordered arrangement of **strong** and **weak** nodes. Such a hierarchy results in a **metrical grid** from which the stress levels of individual syllables can be read off, e.g.:



This theory, too, was extended into other areas, such as syllable structure (Kahn 1976), and even into tonal structure, which in some cases can be shown to involve hierarchical organisation. Later versions of the theory (e.g., Halle and Vergnaud 1987; Hayes 1995) were particularly concerned with the typology of stress systems, and have been very influential.

A number of other theories also developed within the generative framework, one of the most important of which is **lexical phonology** (Mohanan 1986). Deriving from generative work on morphology, this approach develops the cyclical principles of SPE in ways which integrate phonological and morphological processes. The theory of **prosodic phonology** (Nespor and Vogel 1986) developed a view of prosodic structure comprising a hierarchy of prosodic units; **moraic phonology** (Hayes 1989) incorporates the classical quantitative unit of the **mora** in order to account for length and syllable weight.

The phonological representations assumed in these theories are very different from those of the SPE model, and their introduction involves a shift of focus away from discussions of such issues as abstractness or rule ordering, and the appropriate formalisms, towards an exploration of the structural complexities of such representations. Nevertheless, many of the original principles of generative phonology, such as the postulation of an abstract underlying phonological structure related by rules to a phonetic representation, are not abandoned.

The most dynamic development in phonological theory since non-linear phonology is **Optimality Theory** (OT) [*see* OPTIMALITY THEORY], which was first presented in the early 1990s. While maintaining some characteristics of GP, such as the distinction between underlying and surface representations, it has abandoned much of the apparatus of the SPE model, including phonological rules, which are replaced by **constraints**. This theory can therefore with some justification be regarded as no longer falling under the heading of generative phonology.

A. F.

Suggestions for further reading

Chomsky, N. and Halle, M. (1968) *The Sound Pattern of English*, New York: Harper & Row.
Durand, J. (1990) *Generative and Non-Linear Phonology*, London: Longman.
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Generative semantics

Generative semantics was an important framework for syntactic analysis within generative grammar in the late 1960s and early 1970s. This approach, whose leading figures were George Lakoff, James McCawley, Paul Postal and John R. Ross, at first posed a successful challenge to Chomsky's 'interpretive semantics' [*see* INTERPRETIVE SEMANTICS]: indeed, around 1970 probably the great majority of generative grammarians claimed allegiance to it. However, its relative importance had begun to decline by around 1973 or 1974, and today it has all but ceased to exist.

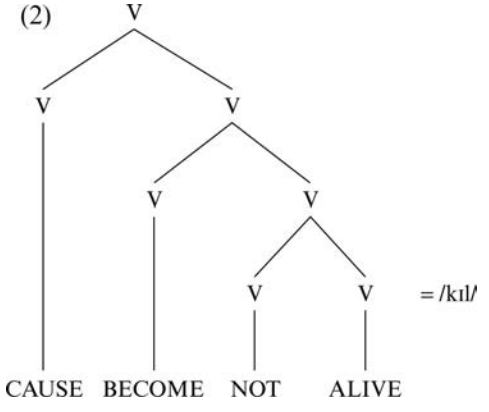
The leading idea of generative semantics is that there is no principled distinction between syntactic processes and semantic processes. This notion was accompanied by a number of subsidiary hypotheses: first, that the purely syntactic level of 'deep structure' posited in Chomsky's 1965 book *Aspects of the Theory of Syntax* (*Aspects*) [*see* GENERATIVE GRAMMAR] cannot exist; second, that the initial representations of derivations are logical representations which are identical from language to language (the **universal-base hypothesis**); third, all aspects of meaning are representable in phrase-marker form. In other words, the derivation of a sentence is a direct transformational mapping from semantics to surface structure. Figure 1 represents the initial (Chomsky 1967) generative-semantic model.

In its initial stages, generative semantics did not question the major assumptions of Chomsky's *Aspects* theory; indeed, it attempted to carry them through to their logical conclusion. For example, Chomsky had written that 'the syntactic component of a grammar must specify, for each sentence, a *deep structure* that determines its semantic representation' (1965: 16). Since in the late 1960s little elaborative work was done to specify any interpretive mechanisms by which the deep structure might be mapped on to meaning, Lakoff and others took the word 'determines' in its most literal sense, and simply equated the two levels. Along the same lines, Chomsky's (tentative) hypothesis that selectional restrictions were to be stated at deep structure also led to that level being conflated with semantic representation. Since sentences such as (1a) and (1b), for example, share several selectional properties – the possible subjects of *sell* are identical to the possible objects of *from* and so on – it was reasoned that the two sentences had to share deep structures. But, if such were the case, generative semanticists reasoned, then that deep structure would have to be so close to the semantic representation of the two sentences that it would be pointless to distinguish the two levels.

1. (a) Mary sold the book to John.
   (b) John bought the book from Mary.

As Figure 1 indicates, the question of how and where lexical items entered the derivation was a topic of controversy in generative semantics. McCawley (1968) dealt with this problem by treating lexical entries themselves as structured composites of semantic material (the theory of **lexical decomposition**), and thus offered (2) as the entry for *kill*:

(2)



After the transformational rules had created a substructure in the derivation that matched the structure of a lexical entry, the phonological matrix of that entry would be insertable into the

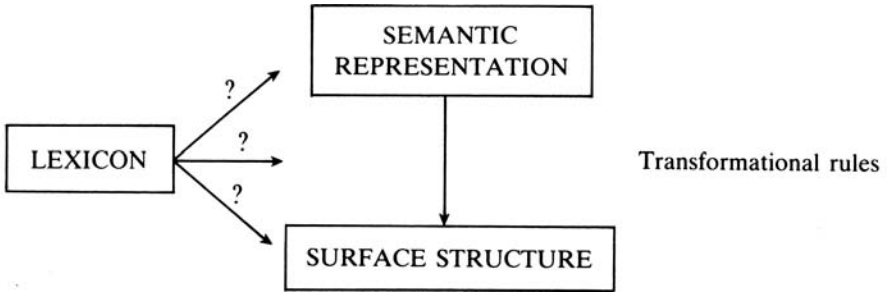


Figure 1

derivation. McCawley hesitantly suggested that lexical-insertion transformations might apply in a block after the application of the cyclic rules; however, generative semanticists never did agree on the locus of lexical insertion, nor even whether it occurred at some independently definable level at all.

Generative semanticists realised that their rejection of the level of deep structure would be little more than word-playing if the transformational mapping from semantic representation to surface structure turned out to be characterised by a major break before the application of the familiar cyclic rules – particularly if the natural location for the insertion of lexical items was precisely at this break. They therefore constructed a number of arguments to show that no such break existed. The most compelling were moulded after Morris Halle's classic argument against the structuralist phoneme (Halle 1959) [*see* GENERATIVE PHONOLOGY]. Paralleling Halle's style of argumentation, generative semanticists attempted to show that the existence of a level of deep structure distinct from semantic representation would demand that the same generalisation be stated twice, once in the syntax and once in the semantics (see Postal 1970).

Since a simple transformational mapping from semantics to the surface entails that no transformation can change meaning, any examples that tended to show that such rules were meaning-changing presented a profound challenge to generative semantics. Yet such examples had long been known to exist; for example, passive sentences containing multiple quantifiers differ in meaning from their corresponding actives. The scope differences between (3a) and (3b), for example, seem to suggest that Passive is a meaning-changing transformation:

3. (a) Many men read few books.
   (b) Few books were read by many men.

The solution to this problem put forward by Lakoff (1971a) was to supplement the strict transformational derivation with another type of rule – a **global rule** – which has the ability to state generalisations between derivationally non-adjacent phrase markers. Examples (3a–b) were handled by a global rule that says that if one logical element has wider scope than another in semantic representation, then it must precede it in surface structure. This proposal had the virtue of allowing both the hypothesis that transformations are meaning-preserving and the hypothesis that the deepest syntactic level is semantic representation to be technically maintained.

Soon many examples of other types of processes were found which could not be stated in strict transformational terms, but seemed instead to involve global relations. These involved presupposition, case assignment and contractions, among other phenomena. For a comprehensive account of global rules, see Lakoff (1970).

In the late 1960s, the generative semanticists began to realise that, as deep structure was pushed back, the inventory of syntactic categories became more and more reduced. And those remaining categories bore a close correspondence to the categories of symbolic logic [*see* FORMAL LOGIC AND MODAL LOGIC]. The three categories whose existence generative semanticists were certain of in this period – sentence, noun phrase and verb – seemed to correspond directly to the proposition, argument and predicate of logic. Logical connectives were incorporated into the class of predicates, as were quantifiers. This was an exhilarating discovery for generative semanticists and indicated to them more than anything else that they were on the right track. For, now, the deepest level of representation had a 'natural' language-independent basis, rooted in what Boole (1854) had called 'The Laws of Thought'. What is more, syntactic work in languages other than English was leading to the same three basic categories for all languages. The universal base hypothesis, not surprisingly, was seen as one of the most attractive features of generative semantics.

The development of generative semantics in the early 1970s was marked by a continuous elaboration and enrichment of the theoretical devices that it employed in grammatical description. By 1972, George Lakoff's conception of grammatical organisation appeared as in Figure 2 (an oversimplified diagram based on the discussion in Lakoff 1974).

This elaboration was necessitated by the steady expansion of the type of phenomena that generative semanticists felt required a 'grammatical' treatment. As the scope of formal grammar expanded, so did the number of formal devices

and their power. Arguments motivating such devices invariably took the following form:

4. (a) Phenomenon P has in the past been considered to be simply 'pragmatic'; that is, part of performance and hence not requiring treatment within formal grammar.
   (b) But P is reflected both in morpheme distribution and in the 'grammaticality' judgements that speakers are able to provide.
   (c) If anything is the task of the grammarian, it is the explanation of native-speaker judgements and the distribution of morphemes in a language. Therefore, P must be handled in the grammar.
   (d) But the grammatical devices now available are insufficient for this task. Therefore, new devices of greater power must be added.

John R. Ross (1970) and Jerrold Sadock (1974) were the first to argue that what in the past had been considered to be 'pragmatic' phenomena were amenable to grammatical treatment. Both linguists, for example, argued that the type of speech act [*see* SPEECH-ACT THEORY] a sentence represents should be encoded directly in its semantic representation, i.e. its underlying syntactic structure. Analogously, George Lakoff (1971b) arrived at the conclusion that a speaker's beliefs about the world needed to be encoded into syntactic structure, on the basis of the attempt to account syntactically for judgements such as the following, which he explicitly regarded as 'grammaticality' judgements:

5. (a) John told Mary that she was ugly and then she insulted him.
   (b) *John told Mary that she was beautiful and then she insulted him.

He also argued that, in order to provide a full account of the possible antecedents of anaphoric expressions, even deductive reasoning had to

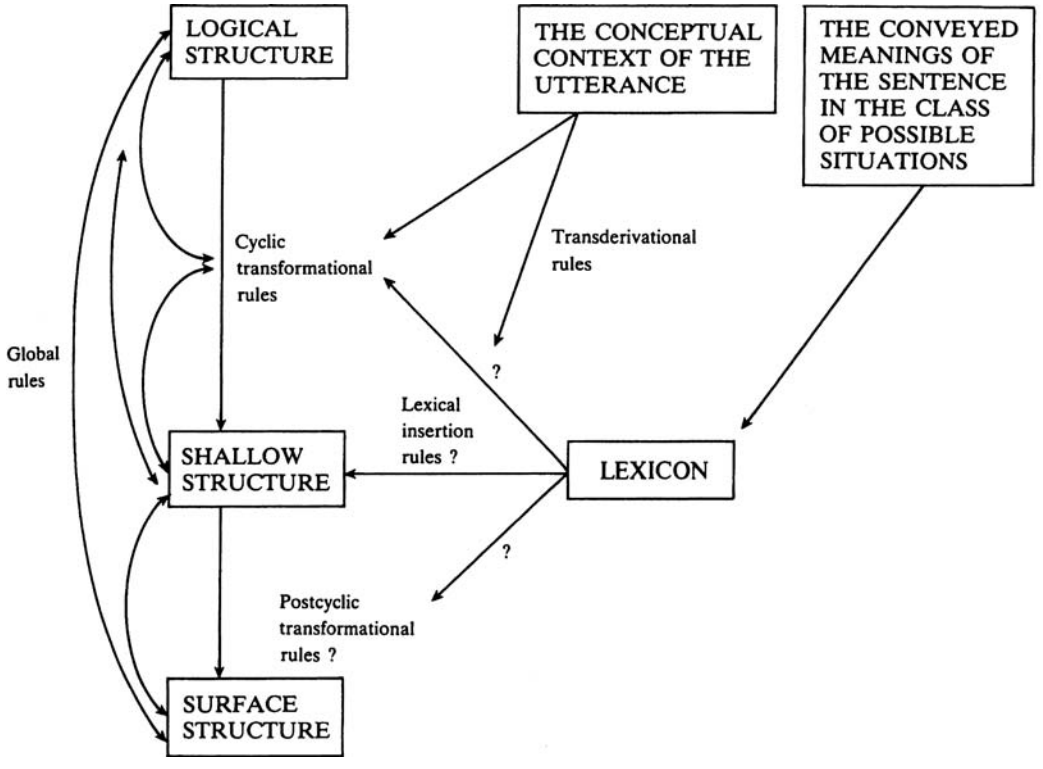


Figure 2

enter into grammatical description (Lakoff 1971c). As Lakoff pointed out, the antecedent of *too* in (6), 'the mayor is honest', is not present in the logical structure of the sentence, but must be deduced from it and its associated presupposition, 'Republicans are honest':

6. The mayor is a Republican and the used-car dealer is honest too.

The deduction, then, was to be performed in the grammar itself.

Finally, Lakoff (1973) concluded that the graded nature of speaker judgements falsifies the notion that sentences should be either generated, i.e. be considered 'grammatical', or not generated, i.e. be treated as 'ungrammatical'. Lakoff suggested instead that a mechanism be devised to assign grammaticality *to a certain degree*. The particulars of **fuzzy grammar**, as it was called, were explored primarily in a series of papers by John R. Ross (see especially Ross 1973).

Not surprisingly, as the class of 'grammatical' phenomena increased, the competence–performance dichotomy became correspondingly cloudy. George Lakoff made it explicit that the domain of grammatical theory was no less than the domain of linguistics itself. Grammar, for Lakoff, was to:

> specify the *conditions* under which sentences can be *appropriately* used … One thing that one might ask is whether there is anything that does *not* enter into rules of grammar. For example, there are certain concepts from the study of social interaction that are part of grammar, e.g., relative social status, politeness, formality, etc. Even such an abstract notion as *free goods* enters into rules of grammar. Free goods are things (including information) that everyone in a group has a right to.
>
> (Lakoff 1974: 159–61; italics in original)

Since it is hard to imagine what might not affect the appropriateness of an utterance in actual discourse, the generative-semantic programme with great rapidity moved from the task of grammar construction to that of observing language in its external setting. By the mid-1970s, most generative semanticists had ceased proposing explicit grammatical rules altogether. The idea that any conceivable phenomenon might influence such rules made doing so a thorough impracticality.

As noted above, generative semantics had collapsed well before the end of the 1970s. To a great extent, this was because its opponents were able to show that its assumptions led to a too-complicated account of the phenomenon under analysis. For example, interpretivists showed that the purported reduction by generative semantics of the inventory of syntactic categories to three was illusory. As they pointed out, there is a difference between nouns, verbs, adjectives, adverbs, quantifiers, prepositions and so on in surface structure, regardless of what is needed at the most underlying level. Hence, generative semantics would need to posit special transformations to create derived categories, i.e. categories other than verb, sentence and noun phrase. Along the same lines, generative semantics never really succeeded in accounting for the primary function of the renounced level of deep structure – the specification of morpheme order. As most syntacticians soon realised, the order of articles, adjectives, negatives, numerals, nouns and noun complements within a noun phrase is not predictable, or even statable, on semantic grounds. How, then, *could* generative semantics state morpheme order? Only, it seemed, by supplementing the transformational rules with a close-to-the-surface filter that functioned to mimic the phrase-structure rules of a theory with the level of deep structure. Thus, despite its rhetorical abandonment of deep structure, generative semantics would end up slipping that level in through the back door.

The interpretive account of 'global' phenomena, as well, came to be preferred over the generative-semantic treatment. In general, the former involved co-indexing mechanisms, such as traces, that codified one stage of a derivation for reference by a later stage. In one sense, such mechanisms were simply formalisations of the global rules they were intended to replace. Nevertheless, since they involved the most minimal extensions of already existing theoretical devices, solutions involving them, it seemed, could be achieved without increasing the power of the theory. Co-indexing approaches came to be more and more favoured over global

approaches since they enabled the phenomenon under investigation to be concretised and, in many cases, pointed the way to a principled solution.

Finally, by the end of the decade, virtually nobody accepted the generative-semantic attempt to handle all pragmatic phenomena grammatically. The mid- and late 1970s saw an accelerating number of papers and books which cast into doubt the possibility of one homogeneous syntax–semantics–pragmatics and its consequent abandonment of the competence–performance distinction.

While the weight of the interpretivist counter-attack was a major component of the demise of generative semantics, it was not the deciding factor. In fact, it is not unfair to say that generative semantics destroyed itself. Its internal dynamic led it irrevocably to content itself with mere descriptions of grammatical phenomena, instead of attempting explanations of them.

The dynamic that led generative semantics to abandon explanation flowed from its practice of regarding any speaker judgement and any fact about morpheme distribution as a de-facto matter for grammatical analysis. Attributing the same theoretical weight to each and every fact about language had disastrous consequences. Since the number of facts is, of course, absolutely overwhelming, simply *describing* the incredible complexities of language became the all-consuming task, with formal explanation postponed to some future date. To students entering theoretical linguistics in the mid-1970s, who were increasingly trained in the sciences, mathematics and philosophy, the generative-semantic position on theory construction and formalisation was anathema. It is hardly surprising that they found little of interest in this model.

At the same time that interpretivists were pointing out the syntactic limitations of generative semantics, that framework was co-opted from the opposite direction by sociolinguistics. Sociolinguists looked with amazement at the generative-semantic programme of attempting to treat societal phenomena in a framework originally designed to handle such sentence-level properties as morpheme order and vowel alternations. They found no difficulty in convincing those generative semanticists most committed to studying language in its social context to drop whatever lingering pretence they still might have of doing a grammatical analysis, and to approach the subject matter instead from the traditional perspective of the social sciences.

While generative semantics is now no longer regarded as a viable model of grammar, there are innumerable ways in which it has left its mark on its successors. Most importantly, its view that sentences must at one level have a representation in a formalism isomorphic to that of symbolic logic is now widely accepted by interpretivists, and in particular by Chomsky. It was generative semanticists who first undertook an intensive investigation of syntactic phenomena which defied formalisation by means of transformational rules as they were then understood, and led to the plethora of mechanisms such as **indexing devices**, **traces** and **filters**, which are now part of the interpretivists' theoretical store. Even the idea of lexical decomposition, for which generative semanticists were much scorned, has turned up in the semantic theories of several interpretivists. Furthermore, many proposals originally mooted by generative semanticists, such as the non-existence of extrinsic rule ordering, post-cyclic lexical insertion, and treating anaphoric pronouns as bound variables, have since appeared in the interpretivist literature.

Finally, the important initial studies that generative semantics inspired on the logical and sub-logical properties of lexical items, on speech acts, both direct and indirect, and on the more general pragmatic aspects of language, are becoming more and more appreciated as linguistic theory is finally developing the means to incorporate them. The wealth of information and interesting generalisations they contain have barely begun to be tapped by current researchers.

F. J. N.

Suggestions for further reading

McCawley, J.D. (1976) *Grammar and Meaning*, New York: Academic Press.

Newmeyer, F.J. (1986) *Linguistic Theory in America: The First Quarter Century of Transformational Generative Grammar*, 2nd edn, New York and London: Academic Press; especially Chapters 4 and 5.

Genre analysis

Over the past twenty years genre analysis has become established as one of the most popular frameworks for the study of specialised writing in academic, professional and institutional contexts. More recently, this has extended into a framework to examine not only texts but also the contexts of writing and talk. Essentially genre analysts seek to describe texts within textual and social contexts, counteracting any tendency to treat individual texts in isolation from others. In doing so they not only underline the social nature of the production and reading of texts, but see language itself as embedded in (and constitutive of) social realities, since it is through recurrent use of conventionalised forms that individuals develop relationships, establish communities and get things done. As a result, genre analysis has the potential to offer descriptions and explanations of both texts and the communities that use them.

Genre and analysis

The word *genre* comes from the French word for 'kind' or 'class' and is widely used in rhetoric, literary theory, media theory and more recently linguistics to refer to a distinctive type of text. In linguistics genre analysis is essentially an exercise in the classification of 'typified acts of communication' based on their form and purpose. Basically, genres are rhetorical actions that writers draw on to respond to perceived repeated situations; users see certain language choices as representing effective ways of getting things done in familiar contexts. Genre analysis is therefore based on the assumption that the features of a similar group of texts depend on the social context of their creation and use, and that those features can be described in a way that relates a text to others like it and to the choices and constraints acting on text producers.

The repeated features which inform the analyst's descriptions are the very stuff of communication. O'Sullivan et al. (1994: 128), for instance, argue that 'genres are agents of ideological closure – they limit the meaning-potential of a given text' while writers can rely on readers already having knowledge and expectations about the conventions of a genre. We know immediately, for example, whether a text is an essay, a joke or a recipe, but we can also recognise innovation, irony and creativity. Genres can thus be seen as a kind of shorthand serving to increase the efficiency of communication. They are a tacit contract between authors and readers, which 'control the behaviour of producers of such texts, and the expectations of potential consumers' (Hodge and Kress 1988: 7).

Perceptions and approaches

It is usual to identify three broad, overlapping schools of genre analysis. While these approaches are united by a common attempt to describe and explain regularities of purpose, form and situated social action, they differ in the emphasis they give to text or context, the research methods they employ, and the types of pedagogies they encourage.

The New Rhetoric approach, influenced by post-structuralism, rhetoric and first-language composition, studies genre 'as the motivated, functional relationship between text type and rhetorical situation' (Coe et al. 2002: 195). The focus here is mainly on the rhetorical contexts in which genres are employed rather than detailed analyses of text elements, and analysis seeks to unpack the complex relations between text and context and the ways that each shapes the other. This perspective shows that there are a wide variety of literacy practices relevant to particular times, places, participants and purposes and that these practices are not something that we simply pick up and put down, but are integral to our individual identity, social relationships and group memberships. Genre analysis in this perspective means investigating the activities that go on around texts, how they are produced, negotiated and evolve in social, cultural and institutional contexts. Ethnographic, rather than linguistic, research tools are widely employed to study the attitudes and values of the communities which employ particular genres.

A second orientation, based on **systemic functional linguistics** [*see* SYSTEMIC-FUNCTIONAL GRAMMAR], stresses the sequential character of different genres and the ways language is systematically linked to context through patterns of lexico-grammatical and rhetorical features (Christie and Martin 1997). These patterns structure texts into stages and, in turn, each stage supports

the purpose of the genre. Because this conception of genre has emerged within a linguistic framework, genres are characterised as broad rhetorical patterns such as **narratives**, **recounts**, **arguments**, and **expositions**. These are referred to as **elemental genres** which combine to form more complex everyday **macro genres**. Thus, an elemental genre such as a **procedure** can be found in macro genres such as **lab reports**, **instruction manuals**, and **recipes**, while a macro genre like a **newspaper editorial** might be composed of several elemental genres such as an **exposition**, a **discussion** and a **rebuttal**. Descriptions of the typical stages and features of valued genres is a means to educational ends in this perspective, and a rich methodology has developed to provide both first- and second-language learners with access to socially valued genres through an explicit grammar of linguistic choices.

Finally, the **ESP approach** sees genre as a class of communicative events employed by specific discourse communities (Swales 1990). Genres are therefore the property of the communities that use them rather than the wider culture, and analysts look to the specific practices of those groups and the names group members have for those practices. As Swales (1998: 20) observes:

> discourse communities evolve their own conventions and traditions for such diverse verbal activities as running meetings, producing reports, and publicising their activities. These recurrent classes of communicative events are the genres that orchestrate verbal life. These genres link the past and the present, and so balance forces for tradition and innovation. They structure the roles of individuals within wider frameworks, and further assist those individuals with the actualisation of their communicative plans and purposes.

Although Swales goes on to show that matters may be more complex than this, the idea that people acquire, use, and modify texts in the course of acting as members of academic, occupational, or social groups offers a powerful way of describing communities and understanding the writing needs of students in professional and academic contexts.

Dimensions of analysis

Genres, then, are rhetorical actions that we draw on to respond to perceived repeated situations, and they can be analysed as texts, as social actions, or as articulations of specific, institutionally authorised, ways of representing, acting and being.

One approach to analysis, favoured in different ways by SFL and ESP approaches, focuses on **genre-as-text**. This means studying the linguistic features and organisational features of collected instances of texts. A productive line of inquiry has been to identify the recognisable structural identity of particular institutional genres in terms of their **stages** (or **rhetorical structures**) and the constraints on typical move sequences (Swales 1990). While analysing schematic structures has proved a useful way of looking at texts, analysts are increasingly aware of the dangers of oversimplifying by assuming blocks of texts to be mono-functional and ignoring writers' complex purposes and 'private intentions' (Bhatia 1999). Analysts also need to validate analyses to ensure they are not simply products of the analyst's intuitions.

Mainstream research has gradually moved away from genre staging to examine clusters of register, style, lexis and other rhetorical features which might distinguish particular genres. Some examples of this are studies of **nominalisation**, which packages processes as things to conceal agency and control information flow in scientific research articles; the use of strategies to hold off turn-taking in broadcast interviews; reader-oriented features on medicine-bottle labels; and the use of mitigation in teacher-written feedback to students. A feature of much recent work has been a growing interest in how persuasion in various genres is not only accomplished through the representation of ideas but also by the construction of an appropriate authorial self and the negotiation of accepted participant relationships.

A second analytical perspective is **genre-as-discursive practice**, which involves looking at the immediate context in which texts are produced, circulated, distributed and used in society. One approach here is the study of genre networks, or the totality of genres employed in a particular domain, as each genre interacts with, draws on, and responds to another in a particular

setting. This refers to Bakhtin's (1986) concept of **intertextuality** and the fact that every utterance reacts to other utterances in that domain. While this totality is constantly changing, analysis can help show how text users are linked into a network of prior texts according to their group membership. A variety of methods have been adopted to extend analyses beyond the page or screen to the sites where community conventions of interaction can facilitate and constrain communication. Thus research has employed ethnographic case studies, reader responses, and interviews with insider informants to infuse text analyses with greater validity and offer richer understandings about the use of genres in different contexts.

A third analytic focus is **genre-as-social-practice** which moves further from the text and beyond the immediate context of situation to consider the wider context of culture. This refers to the meanings which arise out of the organisation of social institutions or the 'general framework that gives purpose to interactions of particular types, adaptable to the many specific contexts of situation that they get used in' (Eggins 1994: 32). Broadly this concerns the ideological effects and hegemonic processes in which genres operate. By providing writers with socially authorised ways of communicating, genres incorporate the interests and values of particular social groups in any institutional and historical context and work to reinforce particular social roles for individuals and relationships between writers and readers. This is the territory of critical discourse analysis [*see* CRITICAL DISCOURSE ANALYSIS], which sees genre analysis as one means of revealing the ideological underpinnings of discourse.

Genre pedagogies

Despite reservations about the value of explicit genre teaching by situated learning theorists, the findings of genre analysis have had a major impact on language teaching worldwide. Genre descriptions ground teaching in research and support learners through an explicit understanding of how target texts are structured and the reasons they are written as they are. Providing writers with knowledge of formal patterns in this way represents an important shift in writing instruction away from a view of writing as an individual struggle for personal expression to a conscious and informed manipulation of language. The teaching of key genres is therefore a means of scaffolding learners' access to ways of communicating that have accrued cultural capital in particular professional, academic and occupational communities. By making the genres of power visible and attainable through explicit instruction, genre pedagogies seek to demystify the kinds of writing that will enhance learners' career opportunities and provide access to a greater range of life choices. Without the resources to understand these genres, students might continue to find their own writing practices regarded merely as failed attempts to approximate prestigious forms.

For some critics, however, providing students with more effective access to the dominant genres of our culture simply effects the direct transmission of text types and lends itself to an uncritical reproduction of texts and their related institutions. For others, learning about genres provides a necessary basis for critical engagement with cultural and textual practices, for by providing learners with an explicit rhetorical understanding of texts and a metalanguage with which to analyse them, teachers can assist students to see texts as artefacts that can be explicitly questioned, compared, and deconstructed, thereby revealing their underlying assumptions and ideologies. As Christie (1987: 30) has observed, 'learning the genres of one's culture is both part of entering into it with understanding, and part of developing the necessary ability to change it'.

Conclusion

Analysts agree that genres are complex. Whether they choose to analyse genres in terms of their textual features, social actions, communities of practice or power structures, they only see a partial view of all that is 'going on'. This complexity is perhaps what many scholars are drawn to; genres are a kind of nexus among the textual, social, and political dimensions of writing which make their study both fascinating and central to contemporary applied linguistics.

K. H.

Suggestions for further reading

Bhatia, V.K. (2004) *Worlds of Written Discourse: A Genre-Based View*, London: Continuum.
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Gesture and language

According to Kendon (1980a: 208), 'Speech and movement appear together, as manifestations of the same process of utterance. That is in the translation of "ideas" into observable behaviour which may be read by others as being reportive of those ideas, the output that results is manifested in both speech and movement.' Similarly, McNeill (1992: 2) holds that gestures are an integral part of language as much as are words, phrases and sentences; gesture and language are one system. Building on Karl Bühler's functional theory of language [*see* INTRODUCTION], Müller has proposed that gestures exhibit a potential for language, because they can be used to fulfil the same basic functions as language: they can express inner states and feelings, they may regulate the behaviour of others, and they can represent objects and events in the world (Bühler 1936/1982; Müller 1998a, 1998b). As in language these functions are co-present dimensions of any sign and rather than characterising alternative signs, their 'dominance' within one sign varies. With this systematics in place, we can organise a wide range of visible bodily behaviour into three general categories: expression, appeal, and representation.

Into the category of **expression** fall gestures that express affective states such as:

- moving the fist downward to express anger;
- raising the hands towards the sky to express happiness and joy;
- covering the face to express sadness or grief.

It is important to note that these kinds of expressive bodily movements differ from symptomatic bodily expressions of emotions such as crying, blushing, turning pale and trembling: moving the fist, raising the hands and covering the face are symbolic body movements that are culturally shaped, conventionalised, wilful expressions of emotion. They might have physiological and experiential roots – but they are not purely symptomatic forms of behaviour.

Gestures which fall under the category of **appeal** are primarily used to regulate the behaviour of others:

- moving both hands downward to calm a public;
- placing the extended index across the lips to say 'be quiet';
- waving somebody to come near.

The **representational function of gestures** reveals their potential for language. It is this function that makes it possible for human gestures to develop into fully fledged sign languages of the deaf or alternate sign languages of hearing people (Kendon 1988b). Examples of gestures used with a primarily representational (or **referential**) **function** are (Enfield 2001; Kita 2003; Müller 1998a; Müller et al. in preparation; Sherzer 1973):

- moving the hands as if opening an imaginary window;
- tracing the shape of a picture by using both extended index fingers like pencils;
- modelling objects such as boxes, bowls, buildings, balls, or picture frames;
- pointing with the hands, lips or eyes to visible and invisible objects.

Furthermore, gestures may be used to represent (and refer to) not only concrete entities, events, states and affairs; they are very frequently used to depict abstract notions and concepts such as (Mittelberg 2006, 2008; Müller 2007, 2008a, 2008b):

- holding a sentence as if it were an imaginary box held between two hands;
- moving a flat extended hand downwards, to depict the 'iron curtain' that separated the Eastern from the Western world;

- tracing a wavy line to depict the course of a love relationship.

Such gestural representations are not simple reflections of something in the world. They are mediated by processes of conceptualisation, interaction and the depictive possibilities of visible bodily movement.

An important type of gesture that cross-cuts the functional approach is **performative gesture** (also known as **pragmatic gesture**, or **illocutionary force marker**; Kendon 1995, 2004; Streeck 2005; Teßendorf in preparation), whose primary function is to perform a speech-act [*see* SPEECH-ACT THEORY]. Examples are (Kendon 2004; Morris 1994; Müller 2004; Müller and Speckmann 2002; Teßendorf in press):

- swearing, cursing, blessing;
- presenting an argument on the palm up open hand, as obvious and evident;
- indicating the precision of an argument with a ring gesture (or the 'precision grip');
- dismissing something with a wave of the hand.

With these dimensions in focus, over the past two decades a field of **gesture studies** has emerged, that has focused on gestures as hand movements which are integrated with spoken language; this obviously restricted perspective arises from a focus of interest and a methodological question and is not meant to exclude other modes of human gestural behaviour or expression from the field of gesture studies.

Gesture is a mimetic medium. Drawing on Aristotle's reflections on mimesis in the arts we may distinguish three core aspects of mimesis: the mimetic *material*, the *objects* of mimesis and the mimetic *modes* (Müller et al. in preparation). For gestures, this means that the material in which mimesis may take place is primarily but not only the hand(s). Gestures may be performed with the head, the face, the eyes, the lips, the shoulders, the arms, the trunk, the legs and the feet (separately or conjointly). In short, the **material of gestures** is visible movements of the human body and this material has specific form features and properties: gestures are structured in phases (preparation, retraction, stroke) (cf. Bressem and Ladewig in preparation; Kendon 2004; Kita et al. 1998; Seyfeddinipur 2006), they have certain formal parameters (hand shape, position, orientation, movement) (cf. Kendon 2004; Stokoe 1960), and they come as single units or in sequences of varying complexity (Müller and Tag in preparation; Tag in preparation).

The **mimetic objects** of gestures may be characterised through the functions: expression, representation and appeal. The gestures are either **concrete or abstract referential gestures** and **concrete or abstract deictic gestures** (for alternative classifications see Efron 1972; Ekman and Friesen 1969; Kendon 2004; McNeill 1992; Müller 1998a). Performative gestures may be used to present an argument as an obvious one or to swear that one is speaking the truth. They may also be used to encourage the continuation of a turn at talk or to display the upcoming continuation by a rotating hand movement (Ladewig in preparation). Typically referential gestures are created on the spot and relate to the speaker's online conceptualisation of events, entities, and actions as well as to the interactive affordances of a particular sequential context. On the other hand, performative gestures tend to recur with a stable form and a limited set of meanings. Whether this is due to the restricted set of pragmatic functions as opposed to a potentially unlimited range of referents to talk about, or whether the gestures exhibit a rudimentary conventionalisation is the subject of scholarly debate (Bressem and Ladewig 2009; Kendon 2004).

The **mimetic modes** underlying the creation of gestures (and signs in signed languages) have been termed the **gestural modes of representation (MoR)** (Cohen et al. 1977; Kendon 1980b, 1980c, 1980d, 1988; Mandel 1977; Müller 1998a, 1998b; Streeck 2008; Taub 2001; Wundt 1921). McNeill (1992: 1) describes the transition from hands in action to gestural action:

> The hand represents something other than itself. The hand is not a hand, but the character; the movement is not the hand moving up, but this character climbing up; the space is not the speaker's space, but a fictional space, a narrative space that exists only in the imaginary world of the discourse.

We distinguish four basic cognitive-semiotic processes which guide this process of transformation: the hands act as if performing an everyday activity, they represent an object, they model or draw imaginary shapes and lines, and thus create transient sculptures and drawings (Müller 1998a, 1998b). These four basic mimetic modes imply different forms of **metonymic abstraction** from a perceived object, action or event: when an action is gesturally depicted, the motor pattern or action scheme undergoes modulation (Müller and Haferland 1997) and the cognitive-semiotic processes involved here are metonymic in that a part of the action stands for the action. In the other three cases, the processes involved are synecdochy (i.e. a specific kind of metonymy), but here different parts of the object stand for the object (Müller 1998a): in the **representing mode** a reduced gestalt of the entire object stands for the object; in the **modelling mode**, a three-dimensional shape stands for the modelled object, whereas in the **drawing mode**, the two-dimensional shape of an object stands for the object. There are further noteworthy differences: in the acting and the representing mode we (primarily) face **internal metonymy** (the hands embody parts of the object), whereas in the modelling and drawing MoR we (primarily) face **external metonymy** (the object has to be inferred to by adjacency to the movement and shape of the hands) (cf. Mittelberg 2006; Mittelberg and Waugh in press). That these semiotic processes are not merely post hoc analytical categories has been documented by neurological studies, showing that the representing mode ('body part as object') and the acting mode ('pantomime') are processed in different hemispheres: 'body part as object' is processed in the right and pantomime in the left hemisphere (Lausberg et al. 2003).

From a methodological viewpoint, the gestural modes of representation are an important starting point for a linguistic gesture analysis. Starting from a close account of the gestural form, we may ask, what are the gestural hands actually doing, what are the ephemeral shapes, movements, objects that are created, to arrive at a first account of a basic meaning. We can for instance see that an interlocutor moves the hands as if opening a window. If we take into account the context (semantic, pragmatic, syntactic, sequential position) we can disambiguate this basic meaning and see that the opening of a window refers to a window as part of a narration of a story or of a personal experience. Or we can see how somebody moves his hands as if holding a box, and when looking at the verbal context, we see whether the imagined box is meant to depict an actual box of pencils or for instance a sentence (Mittelberg 2006, 2008). Thus there are at least two steps from form to meaning in gestures, which relate to two different cognitive-semiotic processes: one that ensures sign formation – and another that specifies local meaning (see Mittelberg and Waugh 2009; Müller 2004; Müller et al. in preparation).

Gestures may evolve and develop into a full-fledged language of the hands (Kendon 1988a, 1988b; Stokoe 1960). Gestures and signs of signed languages are both ultimately based on mimesis: they share the *material* and also the basic mimetic *modes* and the cognitive-semiotic processes of sign-formation (cf. Cohen et al. 1977; Kendon 1980b, 1980c, 1980d, 1988a, 1988b; Mandel 1977; Müller 1998a; Müller et al. in preparation; Taub 2001). In signs in signed languages these processes relate mostly to etymology and are therefore often masked by conventionalisation, but in **classifier predicates** they show up clearly. Classifiers are morphologically complex predicates and are an important linguistic device for encoding (among others) spatial information (Perniss 2007: 32): 'In these predicates, the handshape refers to a specific entity by reflecting certain of its salient visual-geometric properties. That is, that handshape "classifies" the entity with respect to inherent properties of size and shape or, in some cases semantic class.'

Perniss (2007) suggests that classifiers fall into three different groups: handling and entity classifiers, and size and shape specifiers, and that they appear to be based on the same four basic modes of representation as spontaneously created gestures: **handling classifiers** are based on the acting mode, **entity classifiers** are based on the representation of objects, and **size and shape specifiers** are based on modelling and drawing shapes and sizes of objects. This indicates that gestures and signs share basic cognitive-semiotic processes of sign formation, but that they differ with regard to the second

level of meaning formation: signs in signed languages undergo full-fledged processes of lexicalisation and grammaticisation whereas most gestures do not; classifiers fall into an intermediate position between spontaneous created gestures and fully lexicalised signs. Gestures are parasitic upon the spoken part of the utterance and achieve disambiguation and locally fixed meanings only in collaboration with the verbal part of the utterance (recurrent gestures are in an intermediate position).

Gestures are part and parcel of the utterance and contribute semantic, syntactic and pragmatic information to the verbal part of the utterance whenever necessary. As a visuo-spatial medium, gestures are well suited to giving spatial, relational, shape, size and motion information, or enacting actions. Speech does what language is equipped for, such as establishing reference to absent entities, actions or events or establishing complex relations. In addition, gestures are widely employed to turn verbally implicit pragmatic and modal information into gesturally explicit information (Kendon 1995, 2004; Müller 2004; Müller and Speckmann 2002; Teßendorf in preparation).

This difference between gestures and vocal or bodily signs in signed languages opens up interesting perspectives onto thought processes underlying the use of language. Because specifically referential gestures do not appear to be subjects to processes of lexicalisation, they offer insights into online processes of thinking for speaking (Cienki and Müller 2008a, 2008b; McNeill 1992, 2005; Müller 2008a, 2008b). For instance when somebody talks about the iron curtain and we see this person performing a gesture which embodies a curtain, this indicates that at that moment he/she envisions the iron curtain *as* a curtain separating the gesture space into two. There is no such thing as a lexicalised gesture for the iron curtain – what the gesture does, is depict some flat vertically oriented entity, separating the speaker's space from the audience's space. This gesture can be understood by the audience as representing the iron curtain because reference is being established verbally (Cienki and Müller 2008a, 2008b). These **metaphoric gestures** foreground semantic information and reveal that meaning is a dynamic process which integrates the individual perspective with the interactive affordances of a given moment. They show that vocal language is inherently **multimodal** (Müller 2003, 2007, 2008a, 2008b).

C. M.

Suggestions for further reading

Cienki, A. and Müller, C. (2008) *Metaphor and Gesture*, Amsterdam and Philadelphia, Pa.: John Benjamins.

Kendon, A. (2004) *Gesture: Visible Action as Utterance*, Cambridge: Cambridge University Press.

McNeill, D. (1992) *Hand and Mind: What Gestures Reveal about Thought*, Chicago, Ill.: University of Chicago Press.

Morris, D. (1994) *Bodytalk: The Meaning of Human Gesture*, New York: Crown Trade.

Glossematics

Introduction

Glossematics is a structural linguistic theory developed in the 1930s by the two Danish linguists, Louis Hjelmslev (1899–1965) and Hans Jørgen Uldall (1907–57).

Hjelmslev had a broad background in comparative and general linguistics. He had studied under Holger Pedersen, whom he succeeded to the Chair of Comparative Philology at the University of Copenhagen in 1937. In 1928 he published *Principes de grammaire générale*, which contains many of the ideas which were later developed further in his glossematic theory, above all the attempt to establish a general grammar in which the categories were defined formally on the basis of their syntagmatic relations. In 1935 he published *La Catégorie des cas I*, presenting a semantic analysis of the category of case.

Uldall had studied phonetics under Daniel Jones and anthropology under Franz Boas, and had felt a strong need for a new linguistic approach when trying to describe American-Indian languages. He spent the years 1933–9 in Denmark, during which period he and Hjelmslev, in very close cooperation, developed the glossematic theory. In 1939 they were approaching a final version, but during the years of the war, which Uldall spent abroad working for the British Council, their cooperation was

interrupted, and it was not until 1951–2 that they had an opportunity to work together again.

In the meantime, Hjelmslev had published an introduction to the theory, *Omkring sprogteoriens grundlæggelse* (1943a), which was published in English in 1953 under the title *Prolegomena to a Theory of Language*. In 1951–2, Uldall wrote the first part (*General Theory*) of what was planned to be their common work, *Outline of Glossematics*, but this first part was not published until 1957. It contains a general introduction, largely in agreement with the *Prolegomena*, but more comprehensible, and a description of a glossematic algebra, meant to be applicable not only to linguistics, but to the humanities in general. The plan had been that Hjelmslev should write the second part, containing the glossematic procedures with all rules and definitions.

However, during the long years of separation, Uldall had come to new conclusions on various points, whereas Hjelmslev on the whole had stuck to the old version of their theory. Some of the differences were due to the fact that Uldall was concerned with fieldwork, whereas Hjelmslev was more interested in the description of well-known languages. Moreover, he found the algebra constructed by Uldall unnecessarily complicated for the purposes of linguistics. Hjelmslev therefore found it difficult to proceed from Uldall's algebraic system and hesitated to write the second part (see Fischer-Jørgensen 1967b). After a while, he decided to return to a simpler algebra used in earlier versions of the theory and to base the second part on the summary he had written in 1941 and revised in 1943. However, illness prevented him from fulfilling this plan. The summary was translated and edited by Francis Whitfield in 1975 under the title *Résumé of a Theory of Language*. This book consists of several hundred definitions and rules with no supporting examples.

An easier access to glossematics is Hjelmslev's many papers on various aspects of the theory, most of which are published in the two volumes of collected articles, *Essais linguistiques* (1959a) and *Essais linguistiques II* (1973a). The papers, 'Structural Analysis of Language' (1947) and 'A Causerie on Linguistic Theory' (written in 1941, in Hjelmslev 1973b), may be recommended as relatively easy introductions to the theory. But the most essential papers are 'Essai d'une théorie des morphèmes' (1938), describing the grammatical inflectional categories on the basis of glossematic functions, and 'La stratiflcation du langage' (1954 and 1959), which contains some revisions of the theory. However, the most important and widely read and commentated glossematic publication is *Omkring sprogteoriens grundlæggelse* (*OSG*) (1943a). (Page numbers refer to *OSG*, because the two editions (1953 and 1961) of the English translation have different page numbers, while both indicating the page numbers of *OSG*.) The shorter book, *Sproget* (1963), translated as *Language* (1970), is not a description of glossematic theory, but a general introduction to linguistics. Several of the chapters, however, show strong traces of glossematics. As short and easy introductions written by other linguists, one may mention Martinet (1946), Malmberg (1964: 140–57) and Whitfield (1954).

General character of glossematic theory

The goal of glossematics is to establish linguistics as an exact science on an **immanent** basis. In *OSG*, Hjelmslev states that it is in the nature of language to be a means to an end, and therefore to be overlooked. It is this peculiarity of language which has led scholars to describe it as 'a conglomerate of non-linguistic (e.g., physical, physiological, psychological, logical, sociological) phenomena', rather than as 'a self-sufficient totality, a structure *sui generis*'. This, however, is what the linguist should attempt to do (*OSG*: 7). Glossematics is 'a linguistic theory that will discover and formulate premisses of such a linguistics, establish its methods, and indicate its paths' (*OSG*: 8). 'Theory' in this connection does not mean a system of hypotheses, but 'an arbitrary and at the same time appropriate system of premisses and definitions' (*OSG*: 14).

Behind the linguistic **process** (text), the linguist should seek a **system**, through which the process can be analysed as composed of a limited number of elements that constantly recur in various combinations (*OSG*: 10). For this purpose, it is necessary to establish a procedural method where each operation depends on those preceding it, and where everything is defined. The only concepts necessary to, but not defined within, the theory are a few, such as 'description', 'dependence' and 'presence', which are

defined in epistemology. But before setting up the procedure, the linguistic theoretician must undertake a preliminary investigation of those objects which people agree to call languages, and attempt to find out which properties are common to such objects. These properties are then generalised as defining the objects to which the theory shall be applicable. For all objects of the nature premised in the definition, a general calculus is set up, in which all conceivable cases are foreseen, and which may therefore form the basis of language typology. The calculus itself is a purely deductive system independent of any experience. By virtue of this independence, the theory can be characterised as **arbitrary**, but by virtue of the premises introduced on the basis of the preliminary experience it can be characterised as **appropriate** (*OSG*: 14). In his endeavour to establish linguistics as an exact science, Hjelmslev is inspired by formal logic, but his theory is not fully formalised, and he does not stick to logical functions, but has chosen those functions which he found adequate for the description of language.

The glossematic concept of language

OSG is mainly concerned with the preconditions of the theory; that is, with the features which, according to the preliminary investigations, characterise a **language**.

In his view of the nature of language, Hjelmslev is strongly influenced by Saussure (1916/1974/1983). Like Saussure, Hjelmslev considers language to be a sign structure, a **semiotic system**. Corresponding to Saussure's signifier and signified, Hjelmslev speaks of **sign expression** and **sign content**; and **expression** and **content** are described as the two planes of language (*OSG*: 44ff.). It is a characteristic feature of glossematics that content and expression are regarded as completely parallel entities to be analysed by means of the same procedures, leading to analogous categories. At the same time, however, it is emphasised that the two planes are not conformal. A given sign content is not structured in the same way as the corresponding sign expression, and they cannot be divided into corresponding constituents or **figurae**, as Hjelmslev calls them. Whereas, for example, the Latin sign expression *-us* in *dominus* can be analysed into the expression figurae *u* and *s*, the corresponding sign content is analysed into 'nominative', 'masculine' and 'singular', of which none corresponds specifically to *u* or *s*. In the same way the expression *ram* can be analysed into *r*, *a* and *m*, and the corresponding content into 'he' and 'sheep', but *r*, *a* and *m* do not correspond to any of these content elements.

From the point of view of its purpose, then, language is first and foremost a sign system; but from the point of view of its internal structure, it is a system of figurae that can be used to construct signs. If there is conformity between content and expression, i.e. structural identity, there is no need to distinguish between the two planes. Hjelmslev calls such one-plane systems **symbolic systems** (for example, the game of chess); two-plane structures are called **semiotics**. A natural language is a semiotic into which all other semiotics can be translated, but the glossematic theory is meant to be applicable not only to (natural) languages but to all semiotic systems (*OSG*: 90–7). It is worth pointing out that the terminology I have used above is that used in the English, Italian and Spanish translations of *OSG*, and in the *Résumé*. In the Danish original, the terminology is different, and this terminology has been retained in the French and German translations, although the German gives references to the English terminology. Since this has caused a certain amount of confusion, the correspondences are presented in Table 1.

Content and expression must be analysed separately, but with constant regard to the interplay between them; namely, the function between sign expression and sign content. Replacement of one sign expression, e.g., *ram*, by another, e.g., *ewe*, normally results in another sign content; conversely, the replacement of one sign content, e.g., 'male sheep', by another, e.g.,

Table 1

Version of OSG	*Terminology*	
Original Danish	*sprog*	*dagligsprog*
French	*langue*	*langue naturelle*
German	*Sprache*	*Alltagssprache*
English and *Résumé*	*semiotic*	*language*
Italian	*semiotica*	*lingua*
Spanish	*semiotica*	*lengua*

'female sheep', brings about another sign expression. Parts of signs (figurae) may be replaced in the same way, e.g., /a/ by /ɪ/ in the frame /r–m/, leading to the new sign content 'edge', or 'male' by 'female' in the sign content 'male sheep', resulting in the new sign expression *ewe*. The smallest parts reached by the given procedure and whose replacement may bring about a change in the opposite plane are called **taxemes**. (In the expression plane, the level of taxemes corresponds roughly to that of phonemes.) For this replacement test, glossematics coined the term **commutation test**, which is now widely used. This test has, of course, also been applied by other linguists, e.g., the Prague School linguists, but it is characteristic of glossematics that it stresses the fact that the test may take its point of departure in any of the two planes, as illustrated in the examples above. By means of the commutation test, a limited number of commutable elements, **invariants**, is reached in both planes (*OSG*: 66–7).

It happens that the commutation test gives a negative result in some well-defined positions for elements which have been found to be invariant in other positions. In this case, glossematics uses the traditional term **syncretism**. In Latin, for instance, there is syncretism between the content elements 'dative' and 'ablative' in masculine and neuter singular of the first declension, e.g., *domino;* and in German, there is syncretism between the expression taxemes /p t k/ and /b d g/ in final position – *Rad* and *Rat* are both pronounced [ra:t] – whereas medially there is commutation – [ra:də], [ra:tə] (in the Prague School, syncretism in the expression is called **neutralisation**).

Syncretisms may be manifested in two ways: as **implications** or as **fusions**. When the manifestation is identical with one or more members entering into the syncretism, but not with all, it is called an **implication** – in German, for instance, the syncretism /t/d/ is manifested by [t]. Otherwise, it is called a **fusion** – in Danish there is syncretism between /p/ and /b/ in final position, manifested optionally by [p] or [b], or by something in between. **Latency** is seen as syncretism with zero – in French *petit* [pti], there is syncretism between /t/ and zero. When a syncretism is manifested by an implication – that is, by one of its members – this member is called the **extensive** member of the opposition and the other is called the **intensive** member – thus in German /t/ is extensive and /d/ is intensive. This distinction is related to, but not identical with, the Prague distinction between **unmarked** and **marked** members [*see* FUNCTIONAL PHONOLOGY].

Like Saussure, Hjelmslev also distinguishes between **form** and **substance**, and this distinction is basic in glossematics. But, in contradistinction to Saussure, who sets up one form between two substances, sound and meaning, Hjelmslev operates with two forms, an expression form and a content form. Since the two planes are not conformal, each must be described on the basis of its own form. Form comprises all paradigmatic and syntagmatic functions and the terminal points of these functions, i.e. **elements** and **categories**.

In addition to form and substance, Hjelmslev introduces a third concept, **purport** (French ***matière*** – the Danish term, rather misleadingly, is *mening*, 'meaning'), which refers to sounds and meanings apart from the way in which they are formed linguistically, whereas substance designates linguistically formed purport. It may be formed differently by various sciences like physics or psychology. An example of purport in the content is the colour spectrum. It may be formed differently as content substance of the signs designating colours in different languages – that is, the numbers of colours distinguished and the delimitations between them may be different. As an example of expression purport, one may mention glottal closure or stricture, which may be substance for a consonant in one language and for a prosody or a boundary signal in other languages. (In *OSG*, *substans* is sometimes used for *mening* – e.g., *OSG*: 69–70 – this is corrected in the second edition of the English translation.)

The function between form and substance is called **manifestation**. A given form is said to be manifested by a given substance. Form is the primary object of the linguistic description, and differences between languages are mainly differences of form.

Form is also called **schema**, and in *OSG* **usage** is almost synonymous with substance. But sometimes, such as in the paper 'Langue et parole' (1943b), Hjelmslev draws a distinction

between schema, norm and usage. In this case 'norm' refers to the admissible manifestations, based on the mutual delimitation between the units, e.g., *r* as a vibrant distinguished from *l*, whereas usage refers to the manifestations actually used in the language, e.g., [r] as a tongue-tip vibrant. 'Norm' and 'usage' correspond to Coseriu's (1952) 'system' and 'norm', respectively; the phonemes of the Prague School, which are defined by distinctive features [*see* DISTINCTIVE FEATURES], belong to Hjelmslev's norm.

According to *OSG*, the **relation between form and substance** is a unilateral dependence, since substance presupposes form, but not vice versa. That substance presupposes form simply follows from the definition of substance as formed purport, but the claim that form does not presuppose substance is more problematic. It is evident that the calculus of possible languages can be a purely formal calculus and that it is possible to reconstruct a language, e.g., Proto-Indo-European, without attaching any substance to it [*see* HISTORICAL LINGUISTICS]. But when concrete living languages are involved, it seems fairly obvious that both form and substance must be there. However, Hjelmslev argues that there may be several substances (e.g., speech and writing) attached to the same form, so that the form is independent of any specific substance. It is also said (e.g., in *OSG*: 71) that the description of substance presupposes the description of form, but not vice versa. This is, however, not possible in the preliminary descriptions, but only in the glossematic procedure seen as a final control. In the paper 'La Stratification du langage' (1954), it is stated explicitly that substance has to be taken into account in the operations of communication and identification (see also Fischer-Jørgensen 1967a).

'La Stratification du langage', which resulted from the discussions between Hjelmslev and Uldall in 1951–2, brings in certain revisions. First, content substance, content form, expression form and expression substance are called the four **strata of language**, and a distinction is made between **intrastratal** (**intrinsic**) and **interstratal** (**extrinsic**) functions. **Schema** covers the intrinsic functions in the two form strata, whereas **norm**, **usage** and **speech act** cover interstratal (extrinsic) functions. Usage is no longer used synonymously with substance; the sign function is said to belong to usage – new signs may be formed at any moment – and figurae result from an intrastratal (intrinsic) analysis of each stratum. The sign function is, however, still considered to be a basic linguistic function. It is not quite clear what is meant by an intrinsic analysis of the substance strata. The paper seems to contain some concessions to Uldall's points of view in *Outline*, volume 1, written in 1951–2, views which have not been fully incorporated into Hjelmslev's own theory.

Second, a distinction is made between three **levels of substance** – the **apperceptive** level (Uldall's 'body of opinion'), the **sociobiological** level, and the **physical** level – and these three levels are ranked with the apperceptive level as primary. This represents progress compared to Hjelmslev's rather more physicalistic description of substance in *OSG*.

Substance plays a greater role in *La Stratification* (1954) than in *OSG*, although it appears clearly from *OSG* that Hjelmslev never meant to exclude substance from linguistics; he merely considers form to be its primary object. According to *OSG*, a detailed description of substance is undertaken in **metasemiology**; that is, a metasemiotic which has the linguist's descriptive language (also called a **semiology**) as its object language. In semiology, the ultimate irreducible variants of language – sounds, for instance – are minimal signs, and in metasemiology these units must be further analysed (see *OSG*: 108).

The description of style belongs to the so-called **connotative semiotics**.

On the whole, Hjelmslev sets up a comprehensive system of semiotics and metasemiotics (see *OSG*: 101ff.; Hjelmslev 1975: xviii; Rastier 1985).

The glossematic procedure

An important feature of glossematics is the claim that a formal description of a language must begin with an explicit analysis of texts by means of a constantly continued partition according to strict procedural rules. Such a continued partition is called a **deduction** (a somewhat uncommon use of this term). The functions registered in the analysis are of three types: **determination**, or unilateral presupposition; **interdependence**, or mutual presupposition; and **constellation**, or compatibility without any presupposition.

These three functions have special names according to their occurrence in syntagmatics or paradigmatics (sequence or system). In syntagmatics, they are called **selection**, **solidarity** and **combination**; in paradigmatics, **specification**, **complementarity** and **autonomy**, respectively. This very simple and general system of functions requires the different stages of the analysis to be kept apart, so that a particular function may be specified both by its type and by the stage to which it belongs. This procedure thus involves a hierarchical structure.

The analysis is guided by some general principles, of which the most important is the so-called **empirical principle** ('empirical' is used here in an unusual sense). This principle says that the description shall be free of contradiction (self-consistent), exhaustive and as simple as possible, the first requirement taking precedence over the second, and the second over the third (*OSG*: 12). It is not quite clear whether Hjelmslev wants to apply the empirical principle both to the general calculus and to the description of actual languages. It is particularly in the interpretation of simplicity that glossematics differs from other forms of structural linguistics. According to glossematics, the simplest possible description is the one that leads to the smallest number of minimal elements, while the demand for exhaustiveness implies that as many categories and functions as possible must be registered. A principle of generalisation (*OSG*: 63) prevents arbitrary reduction of the number of elements.

Before stating the functions in an actual case, it is necessary to undertake **catalysis**; that is, to interpolate an entity which is implied in the context. In German *guten Morgen!*, for example, a verb (i.e. a syncretism of all possible verbs) is catalysed as a necessary prerequisite for the accusative (*OSG*: 84).

After the syntagmatic deduction is completed, a paradigmatic deduction is undertaken in which the language is articulated into categories. The paradigmatic deduction is followed by a synthesis. It is a characteristic feature of glossematics that analogous categories are set up for content and expression; Figure 1 gives an example of the parallelism.

It should be kept in mind that in glossematic terminology, **morphemes** are inflectional categories, like case, person, etc., seen as content elements. **Verbal morphemes**, like tense, are considered to characterise the whole utterance, not just the verbal theme.

The definitions of the categories are based on syntagmatic relations, the same definitions applying to content and expression. But, for the categories exemplified in Figure 1, the definitions differ between earlier and more recent glossematic papers. In the recent version, **exponents** are defined as entering into a particular type of **government**, which establishes an utterance and is called **direction**, and **intense** and **extense** exponents are distinguished on the basis of their mutual relations (see Hjelmslev 1951). A unit comprising both constituents and exponents is called a **syntagm**. The minimal syntagm within expression is the syllable; within content, the **noun**.

The requirement that all categories should be defined by syntagmatic functions means that in the content analysis no separation is made between morphology and syntax. Both word classes, which (according to glossematics) are classes of content constituents or **pleremes**, and grammatical classes, classes of **morphemes**, are defined by their syntagmatic functions. The nominal and verbal morphemes are further divided into **homonexual** and **heteronexual** morphemes, according to relations within and across the boundaries of a **nexus** (which roughly equals a clause). Case, for instance, is a homonexual intense morpheme category, whereas mood is an extense morpheme category which can be either homonexual or heteronexual (Hjelmslev 1938).

Vowels and consonants are arranged in categories according to the possibilities for their combination within the central and marginal parts of the syllable, respectively.

Since the principle of simplicity requires a minimal inventory of taxemes, a glossematic analysis often goes further in reduction of the inventory than other forms of analysis. Single sounds may be interpreted as clusters – e.g., long vowels as clusters of identical short vowels, Danish [p] as /b + h/, etc.; and formal syllable boundaries may be used to reduce the inventory, e.g., German [s] and [z] may be reduced to one taxeme by positing a syllable boundary after [s] in *reissen* [rɑisən] /rɑis-ən/ and before [z] in *reisen* [rɑizən] / rɑis-ən/ – by generalisation from initial [z-] and final [-s] (e.g., *so* and *das*).

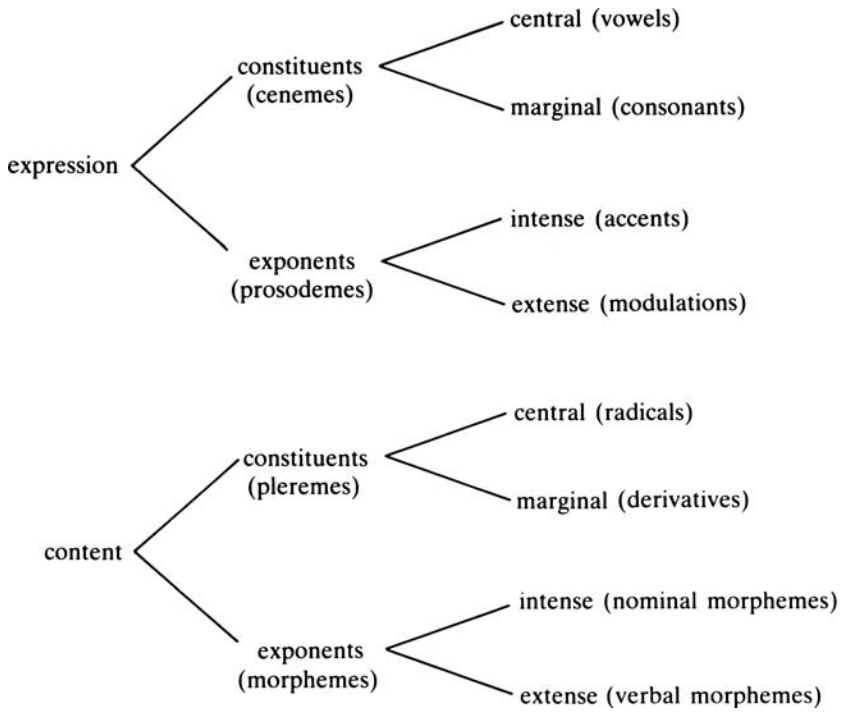

Figure 1

The inventory of sign expressions is also reduced as much as possible. This is accomplished by means of an **ideal notation**, in which syncretisms (including latencies) are resolved. Thus German *lieb–liebe* [li:p–li:bə] is in **actualised notation** /li:p/b–li:bə/, but in ideal notation /li:p–li:bə/, and French *petit–petite* [pti–ptit] is in ideal notation /pətit–pətitə/, where the stem is the same in masculine and feminine and the feminine ending is /ə/. The glossematic ideal notation is closely related to underlying forms in generative phonology [*see* GENERATIVE PHONOLOGY], but ordered rules are not used in glossematics.

Expression taxemes (vowels and consonants) are not analysed further into distinctive features, an analysis which is considered to belong to pure substance, but – both in content and in expression – taxemes within each category are arranged into dimensions in such a way that there is a minimal number of dimensional elements. These dimensional elements are called **glossemes**. The demand for a minimal number of glossemes being absolute, six taxemes are always arranged as two by three, and ten as two by five, etc. Since the number of dimensions is thus fixed irrespective of the language involved, this is called a **universal analysis**. But the placement of the taxemes within the system is language-specific since it is governed by syncretisms, where such are found. If, for instance, a language has syncretism between *p/b*, *t/d* and *k/g*, with $\begin{matrix} p\ t\ k \\ b\ d\ g \end{matrix}$ appearing in the position where the commutation is suspended (i.e. it is an implication), then $\begin{matrix} p\ t\ k \\ b\ d\ g \end{matrix}$ will be placed in a two-dimensional array, /p t k/ as the extensive members, and /b d g/ as the corresponding intensive members. In cases where formal criteria are lacking, affinity to substance may be taken into account.

Members of grammatical categories like case (i.e. nominative, accusative, etc.) are subjected to a similar analysis. Hjelmslev's system of participative oppositions is described in his book on case (1935: 111–26; but note that in this pre-glossematic work he starts from semantics, not from formal facts like syncretisms). Each

dimension may contain from two to seven members, so the oppositions need not be binary.

A characteristic feature of glossematics is the claim that the analysis of content should be continued below the Sign level, not only in the case of grammatical endings like Latin *-us*, but also in the case of themes. Hjelmslev draws a parallel between the analysis of expression units like *sl-* and *fl-*, and content units like 'ram' and 'ewe', which may be analysed into 'he-sheep' and 'she-sheep' (*OSG*: 62–5) by means of commutation. This is evidently feasible for small closed inventories like prepositions, modal verbs, restricted semantic categories of nouns like terms for family relations, etc., but it seems an almost impossible task to reduce the whole inventory of nouns to a restricted number of content figurae, and Hjelmslev gives no further indications concerning the method of analysis. All his examples are analyses of signs (e.g., *ram–ewe–bull–cow*, or *father–mother–brother–sister*), but in the paper 'La Stratification du language' (1954), it is said that the analysis in figurae should be undertaken intrinsically in each stratum. This can, however, only be meant as a final control analysis of what has already been found by means of the commutation test, for commutation is an interstratal function operating with signs and parts of signs. Another problem is the statement in 'Stratification' that the sign function belongs to usage and that it is always possible to form new signs. Thus, if the content form has to be different in different languages, it must be based on different possibilities of combination between the figurae and different types of relation between them within and beyond the sign, and it must be possible to distinguish between accidental gaps and systematic gaps in the sign inventory. There are thus many unsolved problems in this analysis (for discussions, see, for example, Fischer-Jørgensen 1967a; Rischel 1976; Stati 1985).

The influence of glossematics

Applications of glossematics to actual languages are very rare. This is probably due partly to the rather forbidding terminology, which has been exemplified only sporadically above, and partly to the fact that, except for some fragments in scattered papers, the analytical procedure itself and the definitions were not published until 1975, and only in the form of a condensed summary (the *Résumé*) without any examples. A few applications can, however, be mentioned, such as Alarcos Llorach's description of Spanish (1951), Børge Andersen's analysis of a Danish dialect (1959) and Una Canger's (1969) unpublished thesis on Mam. Knud Togeby's analysis of French (1951) is strongly influenced by glossematics, but also by American structuralism.

Glossematics has, however, been eagerly discussed, particularly in the Linguistic Circle of Copenhagen, and although there is no glossematic school as such, a whole generation of Danish linguists has been more or less influenced by Hjelmslev's general ideas about language and by his demand for a stringent method and definitions of the terms employed.

Outside Denmark, glossematics was often discussed in the years following the publication of *OSG*, and particularly after the publication of Whitfield's English translation, by E. Coseriu (1954) and B. Malmberg (1964 and other publications), for example. It has further had a strong influence on the theories of Sidney Lamb (1966) [*see* STRATIFICATIONAL LINGUISTICS] and S.K. Šaumjan (1962). In the 1960s, the interest in glossematics was overshadowed by the success of transformational grammar, but from the end of the 1960s and, particularly in the 1980s, there has been a renewed interest in glossematics, not only in the young generation of Danish linguists, but also outside Denmark, particularly in France and in southern Europe, especially Italy and Spain. Special volumes of the periodicals *Langages* (1967) and *Il Protagora* (1985) have been devoted to glossematics, and treatises concerned particularly with glossematics have been published (e.g., Caputo 1986).

This renewed interest is not in the first place concerned with the glossematic procedures or definitions of linguistic categories, which were the main subjects of discussion in the Linguistic Circle in Hjelmslev's lifetime (see, for example, *Recherches structurales 1949* and *Bulletin du Cercle Linguistique de Copenhague* 1941–5), but mainly with Hjelmslev's general ideas on content and expression, form and substance, and his system of semiotics and metasemiotics – that is, with the epistemological implications of the theory. Moreover, Hjelmslev's demand for a structural analysis of the content has inspired the French

school of semantics (see, for example, Greimas 1966), and the problem of levels in the substance described in 'La Stratification du langage' (1954) has also been taken up.

In this connection, many translations of glossematic works into various languages have been undertaken. Thus glossematics is still a source of inspiration for linguists, semanticists and philosophers.

E. F.-J.

Suggestions for further reading

Hjelmslev, L. (1948) 'Structural Analysis of Language', *Studia Linguistica*: 69–78; reprinted in L. Hjelmslev (1959) *Essais linguistiques: Travaux du Cercle Linguistique de Copenhague*, Vol. XII, Copenhagen: Nordisk Sprog og Kulturforlag.

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Malmberg, B. (1964) *New Trends in Linguistics* (Bibliotheca Linguistica, no. 1), Stockholm: Bibliotheca Linguistica.

Whitfield, F.J. (1954) 'Glossematics', in A. Martinet and U. Weinreich (eds), *Linguistics Today: Publication on the Occasion of Columbia University Bicentennial*, New York: Linguistic Circle of New York.

H

Historical linguistics[1]

Introduction

Historical linguistics examines the nature of linguistic change, looking at how and why languages change, and what the underlying forces and processes are that shape, mould and direct modifications in language. Engaging in this enterprise, historical linguists also map the world's languages, reconstruct their earlier states, determine their relationships to one another and, with the use of written documentation, fit extinct languages of the past into the jigsaw puzzle of the world's complex pattern of linguistic distribution. The historian of language must also identify the various influences that are at work in language change relating to both internal conditions in the linguistic system itself and external forces at play, such as language contact, adherence to social norms and the like.

Historical linguistic studies are important for our understanding of human language in general. Study of language change can reveal or test **language universals**, with data from differences between stages of languages being analogous to the typologist's cross-linguistic surveys [*see* LINGUISTIC TYPOLOGY]. Furthermore, the structural, social and biological complexity of language, and its relationships to other forms of communication, can be fully understood only when we know how it responds to internal and external stimuli. Language is always embedded in a social and historical context.

Historical background

We start with a brief overview of the development of historical linguistics. Discussing the history of the field is not just an antiquarian's exercise, but reveals the course of scholarly investigations that led to dramatic and still highly relevant findings in the eighteenth and nineteenth centuries.

Pre-modern era

The works of early Greek and Roman philosophers and grammarians include musings about **etymology** (in the ancient Greek sense, 'the true meaning of a word'), the **origin of language** and the role of **pattern** (**analogy**) in shaping language, issues that have concerned historical linguists ever since.

But it was with the advent of the European Renaissance that historical linguistics began to come into its own as an independent field of inquiry. Both local (typically Indo-European) and farther flung (typically non-Indo-European) languages came under scholarly scrutiny. As trade routes opened up to the East and explorers ranged the lands of the New World, data on exotic languages began to accumulate and stimulate the imagination. Vernacular languages came to be deemed worthy of study, and diversity in the world's linguistic structures was recognised.

An important trend in the seventeenth century was the effort to compare and classify languages in accordance with their resemblances. The study of etymology also gained momentum, but word derivations were still posited by scholars somewhat haphazardly, for instance, by rearranging the letters of some putative source language, especially Hebrew (thought by many to have been the original language).

Early in the eighteenth century, comparative and historical linguistics gained more consistency.

For instance, Job Ludolf in 1702 stated that affinities between languages must be based on grammatical resemblances rather than vocabulary, and among vocabulary correspondences the emphasis should be on simple words such as those that describe parts of the body. In a paper published in 1710, Gottfried Leibniz maintained that no known historical language is the source of the world's languages since they must be derived from a **proto-speech**. He also attempted to establish language classifications and toyed with the idea of a universal alphabet for all languages.

Despite continued interest in the origin of language, especially in the works of Hobbes, Rousseau, Burnett (Lord Monboddo), Condillac and Herder, the fundamental historical study of language can be said to have begun in earnest at this time through efforts to compare and classify languages in accordance with their origins, hypothetical or otherwise. The crowning achievement in the latter part of the eighteenth century came with the discovery that the Sanskrit language of ancient India was related to the languages of Europe and to Latin and Greek.

Sanskrit and its impact on the West

The first known reference in the West to Sanskrit occurred at the end of the sixteenth century when Filippo Sassetti wrote home to his native Italy about the *lingua Sanscruta* and some of its resemblances to Italian. Others, too, such as B. Schulze and Père Coerdoux, made similar observations on the resemblance of Sanskrit to Latin and European languages. The importance of these relationships came to the fore in 1786, however, when Sir William Jones, a judge in the English colonial administration, announced to the Royal Asiatic Society in Calcutta that Sanskrit, Greek, Latin, Gothic and Celtic seemed to have the same origin, a language that perhaps no longer existed. In his words (in Lehmann 1967: 15):

> The Sanskrit language, whatever be its antiquity, is of a wonderful structure; more perfect than the Greek, more copious than the Latin, and more exquisitely refined than either, yet bearing to both of them a stronger affinity, both in the roots of verbs and in the forms of grammar, than could possibly have been produced by accident; so strong indeed, that no philologer could examine them all three, without believing them to have sprung from some common source which, perhaps, no longer exists: there is a reason, though not quite so forcible, for supposing that both the Gothic and the Celtic, though blended with a very different idiom, had the same origin with the Sanskrit; and the Old Persian might be added to the same family.

Interest in the discovery mounted and, early in the nineteenth century, Sanskrit was being studied in the West. Sanskrit philological studies were initiated in Germany by W. von Schlegel about the time the first Sanskrit grammar in English was published. The linguistic study of this language set in motion the comparison of Sanskrit with languages of Europe, forming the first period in the growth of historical linguistics and setting **comparative linguistics** on a firm footing. Meanwhile, systematic etymological studies helped clarify and cement the family ties of the Indo-European languages. The modern era of historical linguistic studies can be said to have been launched at this point.

The introduction of Sanskrit and its subsequent study in Europe was a prime inducement to **comparative-historical linguistics** (which came to be known also as **comparative philology**). It came at an auspicious moment: the time was right for more cohesive approaches than the sporadic attempts of earlier scholars. It is generally accepted that the nineteenth century is the era *par excellence* of comparative-historical linguistics – a century in which most of the linguistic efforts were devoted to this subject, led (in the main) by German scholarship.

The nineteenth century

A few of the best-known historical linguists of the early nineteenth century are the Dane Rasmus Rask and the Germans Franz Bopp and Jacob Grimm. Bopp (1791–1867) published a work in 1816 comparing the verbal conjugations of Sanskrit, Persian, Latin, Greek and German. After adding Celtic and Albanian, he called these

the **Indo-European family of languages**. Bopp has often been considered the father of Indo-European linguistics.

Rask (1787–1832) wrote the first systematic grammars of Old Norse and Old English and, in 1818, he published a comparative grammar outlining the **Scandinavian languages**, noting their relationships to one another. Through comparisons of word forms, he brought order into historical relationships, matching a letter of one language to a letter in another, so that regularity of change could be observed.

Jacob Grimm (1785–1863) restricted his studies to the **Germanic family**, paying special attention to **Gothic** due to its historical value (having been committed to writing in the fourth century). This endeavour allowed him to see more clearly than anyone before him the systematic nature of **sound change**. Within the framework of comparative Germanic, he made the first statements on the nature of umlaut (see below) and ablaut, or, as it is sometimes called, vowel gradation (as found, for example, in German *sprechen*, *sprach*, *gesprochen* 'speak, spoke, spoken'), and developed, more fully than Rask, the notion of *Lautverschiebung*, or sound shift.

One specific case he examined is referred to as **Grimm's Law** ('law' in the sense of a statement of regular behaviour), or the **First Germanic Sound Shift**. Grimm's *Deutsche Grammatik*, published in 1822, contained general statements about similarities between Germanic obstruents – i.e. plosives, affricates and fricatives – and their equivalents in other languages. Using the old terms of Greek grammar where T = *tenuis* (p, t, k), M = *media* (b, d, g) and A = *aspirate* (f, θ, x), he noted:

Proto Indo-European	=	*Germanic*
T		A
M		T
A		M

A modern tabulation of his conclusions would appear as:

Indo-European	>	*Germanic*
p		f
t		θ
k		x
Indo-European	>	*Germanic*
b		p
d		t
g		k
Indo-European	>	*Germanic*
bh		b
dh		d
gh		g

Interest also began to develop in the causes of language change. Jacob H. Bredsdorff (1790–1841), a disciple of Rask, proposed in 1821 such factors as mishearing, misunderstanding, misrecollection, imperfection of speech organs, indolence, the tendency towards analogy, the desire to be distinct, the need for expressing new ideas and influences from foreign languages.

Some of his ideas are still viable today. For instance, it is recognised that the tendency towards **analogy**, i.e. speakers' desire for uniformity and for regular patterns, causes language to become more rather than less regular in syntax, morphology and phonology. Colloquial speech – which popular, though rarely expert, opinion often classifies as **indolent** – can also eventually result in changes in pronunciation, spelling, grammatical patterning and semantics. And the speech organs certainly are involved in sound changes as well, though we would now speak in terms of physiological constraints on the vocal tract rather than imperfections. The influence from foreign languages is clearly observable when words are borrowed from another language, as when *pizza* entered English from Italian or when *weekend* entered Danish from English. This is often motivated by the need of speakers of a language to express a new idea or name a new thing – pizzas were at one time unfamiliar in the USA and Britain, and at one time Danish did not have a word that could express the conceptualisation of the weekend as a whole. Similarly, new inventions often result in the need for new terminology, as when the advent of computers led to the coinage of the term *software* by analogy with *hardware*, which was itself borrowed from another sphere, namely that of the traditional metal fittings used in strengthening things made of wood.

In the mid-nineteenth century, one of the most influential linguists, August Schleicher

(1821–68), set about reconstructing the hypothetical parent language from which most European languages were derived – the **proto-language** (see below). He also devised the *Stammbaumtheorie* or **genealogical family-tree model** of the **Indo-European languages** (see below). He worked out a typological classification of languages based on the work of his predecessors in which he viewed languages as isolating, agglutinating or inflectional [*see* LINGUISTIC TYPOLOGY]. On a more philosophical level, he brought to linguistics three important concepts mostly rejected today but which at the time stimulated much discussion and work in the discipline; namely: that language is a natural organism, that it evolves naturally in the Darwinian sense, and that language depends on the physiology and minds of people (that is, it has racial connotations). In short, he stimulated a new and different approach to language study – a **biological approach**.

The work of Schleicher represents a culmination of the first phase of historical linguistics in the nineteenth century. In the second half of the century the discipline of linguistics became more cosmopolitan as scholars in countries other than Germany began seriously to investigate linguistic problems. Germany, however, remained the centre of linguistic attention throughout the century.

In 1863, Hermann Grassmann, a pioneer in internal reconstruction (see below), devised a phonetic law based on observations of the Indo-European languages, showing why correspondences established by Grimm did not always work. His **Law of the Aspirates** demonstrated that, when an Indo-European word had two aspirated sounds [*see* ARTICULATORY PHONETICS] in the same syllable, one (usually the first) underwent deaspiration. For example, Sanskrit *da-dhā-mi* 'I put' < **dha-dhā-mi* shows the reduplicated syllable of the root reduced through loss of aspiration (the asterisk indicates that the form is reconstructed). This exception to Grimm's Law, where Sanskrit [d] corresponds to Germanic [d] (compare English *do*) and not to [t], then, proved to be a law itself.

In 1875, still another phonetic law was proposed by Karl Verner (1846–96). This succeeded in accounting for other exceptions to Grimm's statements by showing that the position of the Indo-European accent was a factor in the regularity of the correspondences. For example, Indo-European [t] in [*pətḗr] became [ð] in Germanic [faðar], not [θ], as might be expected. The accent later shifted in Germanic to the first syllable.

In his 1870 *Corsi di Glottologia*, Graziadio Ascoli (1829–1907) demonstrated by comparative methods that certain [k]s elsewhere in Indo-European correspond to Sanskrit [ʃ] (transliterated as *ś*). Compare the word for 'one hundred':

Latin	***c**entum*
Greek	*(he)**k**aton*
Old Irish	***c**et*
Sanskrit	***ś**ata*
English	***h**undred*

By the principles of comparative reconstruction (see below), such correspondences allowed for the positing of an original stop that became a fricative in Sanskrit, thereby ending the belief that Sanskrit was the oldest and closest language to the proto-form or parent language.

The formulation of such sound laws, which appeared to be systematic and regular to the extent that exceptions were laws themselves, gave rise to one of the most important and controversial theories in historical linguistics, promulgated in the doctrine of the Neogrammarians or *Junggrammatiker*.

The Neogrammarian era

Inspired in 1868 by the ideas of Wilhelm Scherer (1841–86) who, in his 1868 book on the history of the German language (Scherer 1868), advocated fixed laws in sound change, the Neogrammarian movement soon dominated linguistic enquiry. To account for situations where phonetic laws were not upheld by the data, Scherer looked to **analogy** as the explanation for change. The chief representatives of the movement – Karl Brugmann, Hermann Osthoff, Berthold Delbrück, Jacob Wackernagel, Hermann Paul and August Leskien – held that phonetic laws were similar to laws of nature in the physical sciences in their consistency of operation. In 1878, in the first volume of a journal edited by Brugmann (1849–1919) and Osthoff (1847–1909), *Morphologische Untersuchungen*,

they delineated the Neogrammarian doctrine and the special designation *junggrammatische Richtung* ('Neogrammarian School of Thought'). The crux of their doctrine was, as Osthoff (1878: 326) put it: 'sound-laws work with a blind necessity' and all discrepancies to these laws were the workings of analogy. Centred around the University of Leipzig, the Neogrammarians saw in sound change the application of laws of a mechanical nature opposed by the psychological propensity of speakers towards regularisation of forms.

The Neogrammarian doctrine did not go unopposed. For example, the psychologist Wilhelm Wundt (1832–1920) found fault with their views relating to psychological aspects of language. In addition, Hugo Schuchardt (1842–1927) of the University of Graz published an article in 1885 on sound laws in which he considered language change to be due to a mixing process both within and outside language, leading to the formulation of a **Substratum Theory**, in which languages are influenced by a mixture of populations (see below).

One further key conceptual innovation of the era came with the work of Ferdinand de Saussure (1857–1913) of the University of Geneva. His view of language as a system of arbitrary signs in opposition to one another and his separation of **synchronic** (descriptive) linguistics and **diachronic** (historical) linguistics into two distinct spheres of investigation earned him the reputation as one of the founders of structural linguistics [*see* INTRODUCTION].

The twentieth century and the modern era

After Saussure and the rise of generative linguistics in the middle of the twentieth century, the field of **descriptive linguistics** developed rapidly while historical linguistics and comparative studies lost their pre-eminence.

Today, among the disciplines that make up the broad field of linguistics (descriptive, historical, sociological, psychological, etc.), historical linguistics, from once being the embodiment of the discipline, has become another branch of the multivaried area of investigation. Contemporary advancements in historical-comparative language studies have been on the practical side, with the collection of data and reformulation of previous work. On the theoretical side, much has come from advancements in descriptive linguistics and other branches of the discipline – for example, from structural concepts such as the phoneme, and refinements in phonetics, to more stringent application of ordered rules and underlying structures, statistical methods and their relationship to language change and language universals, and increased understanding of the social factors relevant to the spread of change.

Principles, methods, objectives and data of historical linguistics

Certain principles in the field of historical linguistic enquiry are taken as axiomatic; for example:

- All languages are in a continual process of change.
- Language change is regular and systematic, allowing for unhindered communication among speakers.
- Linguistic and social factors are interrelated in language change.
- All languages are subject to the same kinds of modifying influences, including the constraints and restrictions associated with the notion of 'possible human language'.

To elaborate on this last point, a linguistic change or state not attested in known languages would be suspect if posited for an earlier stage through reconstruction. A sound change like [b] → [k] between vowels would be considered unlikely on phonetic grounds. Similarly, no system of consonants in any known language consists entirely of voiced fricatives, so that any reconstruction that ignored this observation and posited only voiced fricatives would be highly questionable. [*See* ARTICULATORY PHONETICS.]

The **diachronic study** of language may be approached by comparing one or more languages at different stages in their histories. **Synchronic** studies underlie historical investigations inasmuch as an analysis of a language or a part thereof at period *A* can then be compared to a descriptive study at period *B*. For example, an investigation of English at the time of Chaucer, and another of Modern English, would reveal a number of differences. Similarly, a descriptive statement of Latin and one of Modern French would disclose very different systems in phonology and

morphosyntax. The **historical linguist** attempts to classify these differences and to explicate the manner and means by which they came about.

When the various historical facts of a language are discovered, the investigator might then establish general rules based on the data. These rules will demonstrate in more succinct form the manner in which the language changed and how it differs from other related languages.

Rules of change may be written in several ways: [t] → [d]/V_V states that the sound [t] becomes [d] in the environment between vowels. Such rules can also be stated in **feature specification**:

$$\begin{bmatrix} +\text{consonantal} \\ +\text{plosive} \\ +\text{coronal} \\ +\text{anterior} \\ -\text{voiced} \end{bmatrix} \rightarrow [+\text{voiced}] / [+\text{vocalic}] \_\_ [+\text{vocalic}]$$

When, as is often the case, an entire class of sounds – for example, [p t k] – behaves in an identical manner, instead of different rules for each sound, one rule suffices:

$$\begin{bmatrix} +\text{consonantal} \\ +\text{plosive} \\ -\text{voiced} \end{bmatrix} \rightarrow [+\text{voiced}] / [+\text{vocalic}] \_\_ [+\text{vocalic}]$$

If we were to compare Latin and Italian, we would find such words as:

Latin	*Italian*	
noctem	*notte*	'night'
octo	*otto*	'eight'
lactem	*latte*	'milk'
factum	*fatto*	'fact'
lectum	*letto*	'bed'

In these examples, and others that could be added, we discover that Latin [k] (e.g., in [noktem]) became Italian [t] in the environment before [t]. This assimilatory change (see below) is a general process in Italian and can be stated in rule-like fashion as: [k] → [t]/__[t], or it can be stated in feature specifications. The rule helps account for the differences between Latin and Italian, and between Italian and other Romance languages, where a different set of changes apply to give, say, Spanish *noche* [nótʃe] and French *nuit* [nyɪ].

Objectives of the practitioners of historical linguistics vary. Excluding here language changes resulting from evolutionary or maturation processes of developing neuro-anatomical structures of *Homo sapiens*, some historical linguists are concerned with phonological, morphological, syntactic and semantic changes that occur in languages over a given period of time, to acquire an understanding of the mechanisms underlying the modifications and to seek explanations for them. Answers to these questions also bear on the nature of the species and may be sought within cognitive and physiological parameters that govern the behaviour of the species.

Other historical linguists may be more concerned with reconstruction and comparison of languages to arrive at historical relationships indicating common origins of languages, which allow them to be grouped into families. The geographical distribution of families is of paramount importance in our understanding of migrations and settlement patterns over the surface of the earth.

Sociological aspects of language change encompassing questions of dialect, style, prestige, taboos, changes in social behaviour, technology and even individual needs to be different are also important considerations in the understanding of cultural associations and ultimately human behaviour.

The changes that languages undergo make up the data for historical linguists and are themselves generally transmitted by and derived from written documentation or reconstructed from the languages in question if such records are not available.

In cases where the underlying language of the documentation is known, such as Old English, Latin and Sanskrit, the investigator must try to determine the orthoepic features of the language through knowledge of the writing system employed, through commentary on the language by contemporary authors, by rhyme and by the pronunciation of the descendent languages.

In dealing with primary written sources inscribed in an unknown language, the investigator must decipher the texts in order to gain a clear view of the underlying linguistic structure. The performance of this task must take into

account the kind of writing system used, the direction of writing and the phonetic basis underlying the orthographic signs. Morphemes and morpheme boundaries must be determined, syntactic features assessed and semantic properties determined.

Phonological change

Regularity of sound change

[For explanation of the phonetic terms in this and the following sections, *see* ARTICULATORY PHONETICS.]

In talking about pronunciation changes, we draw a technical but crucial distinction between **changes in sound** and **sound change proper**, for there can be changes in the phonetic realisation of words that have nothing to do with sound change in its strictest sense (that is, sound change proper). When we speak of sound change proper, we mean modifications in the sounds of a language that are regular and systematic, applying in the same manner in all instances of a specified phonetic environment. The reflexes of the Latin vowel [a], for example, demonstrate this principle.

Latin [a] regularly became French [ɛ] when [a] was accented and free, that is, in an open syllable, as in [má-rem] and the following examples:

Latin	*French*	
marem	*mer* [mɛʁ]	'sea'
fabam	*fève* [fɛv]	'bean'
patrem	*père* [pɛʁ]	'father'
labram	*lèvre* [lɛvʁ]	'lip'

The accented Latin vowel [a] in an open syllable, but followed by a nasal, resulted in [ɛ̃]:

Latin	*French*	
manum	*main* [mɛ̃]	'hand'
panem	*pain* [pɛ̃]	'bread'
planum	*plain* [plɛ̃]	'plane'
famen	*faim* [fɛ̃]	'hunger'

But there are also cases where Latin [a] became French [a], and while these may at first glance appear to have been exceptions to the above rule, they were in fact the result of another regular sound change in which accented [a] behaved predictably in a closed environment, that is, in a closed syllable or one blocked by a consonant, as in [pár-te], [vák-ká], etc. Compare:

Latin	*French*	
partem	*part* [paʁ]	'part'
vaccam	*vache* [vaʃ]	'cow'
carrum	*char* [ʃaʁ]	'cart'
cattum	*chat* [ʃa]	'cat'

And when Latin [a] was closed by a nasal consonant, the result was a nasal [ã] as in:

Latin	*French*	
campum	*champ* [ʃã]	'field'
grande	*grand* [grã]	'large'
annum	*an* [ã]	'year'
manicam (mancam)	*manche* [mãʃ]	'sleeve'

Since the environment dictated the sound change, the conditions of the modifications can be established along the following lines (where . = syllable boundary, C = oral consonant, N = nasal consonant):

[a]> [ɛ]/_ . C
[ɛ̃]/_ . N
[a]/_ C .
[ã]/_ N .

This general rule requires clarification based on further environmental factors that regularly affect the vowel [a]. For example:

Latin	*French*	
alterum	*autre* [otʁ]	'other'
valet	*vaut* [vo]	'is valued'

where [a] plus [l] becomes [au] and subsequently monophthongises to [o].

Beginning in the period of Late Old French, the vowel [ɛ] (from [a]) underwent a further change to become [e] when the syllable became open through the loss of a final consonant, cf.:

Latin	*French*	
clavem	*clé* [kle]	'key'
pratum	*pré* [pre]	'meadow'

When [a] was unaccented, it underwent another set of changes, which resulted in [ə] or [a] as in:

Latin	*French*	
camisam	*chemise* [ʃəmiːz]	'shirt'
amicum	*ami* [ami]	'friend'

The treatment of [a] in the above examples is intended to be indicative of the kind of regularity found in sound change and shows the value of looking to finely grained phonetic environments in determining the correct formulation of sound changes (proper).

Processes of sound change

The mechanisms by which sound change occurs involve changes in the features of a sound (e.g., voiceless, voiced, plosive, fricative) or the addition, loss or movement of sound segments. Many such changes are of an anticipatory nature in that a modification takes place due to the influence of a following sound; for example, the **assimilation** of [k] → [t]/_[t] in Latin *octo* [okto] to Italian *otto* 'eight' is of this type, in which the feature velar is changed to dental before a following dental sound. Compare:

[k]	[t]
voiceless	voiceless
plosive	plosive
velar	dental

Other processes of this type include **nasalisation**, as in Latin *bonum* to Portuguese *bom* [bõ] 'good', where a non-nasal vowel acquires the nasality of a following nasal consonant.

Often a velar consonant becomes a palatal consonant under the influence of a following front vowel that pulls the highest point of the tongue from the velar forward into the palatal zone; such a **palatalisation** is exemplified by Old English *kin* [kɪn] becoming Modern English *chin* [ʧɪn], or Latin *centum* [kentum] becoming Italian *cento* [ʧɛnto] 'one hundred'.

A specific kind of assimilation, referred to as **sonorisation**, involves the voicing of voiceless consonants and appears to be motivated primarily by voiced surroundings. For example, voiceless [p], [t] and [k] became [b], [d] and [g] in the environment between vowels in an earlier stage of Spanish, as in the following examples:

Latin	*Spanish*		
cupa	*cuba* [ˈkúba]	'vat'	[p] → [b]
vita	*vida* [ˈbida]	'life'	[t] → [d]
amica	*amiga* [aˈmiga]	'friend'	[k] → [g]

Assimilation may take place over syllable boundaries, as occurs in the process affecting vowels commonly called **umlaut**. For example, the Proto-Germanic form *[musiz] gave Old English [miːs] (Modern English *mice*) when the tongue position for the vowel in the first syllable was drawn forward through the influence of the front articulation of the vowel in the second syllable. Similarly, Latin *feci* 'I made' gave rise to Spanish *hice* when the influence of the Latin vowel [i] raised [e] to [i] through assimilation. Final [i] subsequently lowered to [e]. Compare also Latin *veni* 'I came' and Spanish *vine*.

The opposite of assimilation, **dissimilation**, modifies a segment so that it becomes less like another, often neighbouring, segment in the word. Dissimilation is less frequent than assimilation in the known histories of the world's languages. The conditioning sound may be adjacent to the sound that undergoes change, or dissimilation may operate at a distance. The first case is illustrated by Latin *luminosum* 'luminous', which became Spanish *lumbroso* when, after the loss of unaccented [i], the resultant nasal + nasal cluster [mn] dissimilated to [mr] and subsequently became [mbr]. The nasal [n], in losing its nasal quality and changing to [r], became less like the adjacent [m]. The second case is illustrated by Latin *arbor* 'tree', which became Spanish *arbol* when [r] changed to [l] under the influence of the preceding [r].

The addition of a segment into a particular environment of the word, **epenthesis**, is essentially a form of anticipation of a following sound and may involve either consonants or vowels. The Middle English verb *glymsen* gave rise to Modern English *glimpse* through the insertion of an epenthetic [p] in the environment [m_s]. The inserted sound develops in the transition between the bilabial [m] and the voiceless and oral [s]. Compare Old English *þunrian*, Modern English *thunder*.

We see epenthesis also at work in the adaptation of foreign loan words to native phonological patterns. For example, Basque speakers borrowed a number of words from late Latin with

certain consonant clusters not found in Basque. Vowels were inserted in the borrowed words to make them more compatible with the Basque phonological system, which, for example, tended to avoid sequences of plosive plus [r]; compare:

Latin	*Basque*	
[krus]	[guruts]	'cross'
[libru]	[libiru]	'book'

The addition of a word-initial segment applied generally to facilitate the pronunciation of an initial consonant cluster is a process referred to as **prothesis**; for example,

Latin	*Spanish*	
schola [skola]	*escuela* [eskwela]	'school'
stella [stela]	*estrella* [estreʎa]	'star'

Sounds are also subject to deletion. The two most common processes of vowel deletion are **apocope** and **syncope**, which are especially common in environments after accented syllables. In word-final position, apocope has been common in the history of many languages including French. Compare:

Latin	*French*	
cane [kane]	*chien* [ʃjɛ̃]	'dog'
caru [karu]	*cher* [ʃɛʁ]	'dear'

The loss of a word-medial vowel, or syncope, occurs in English in words such as *vegetable* ['vɛʤtəbl̩], where the unaccented second syllable lost the vocalic segment. The process does not commonly occur in English, however, but appears much more readily in the Romance languages.

Latin	*Spanish*	*French*	
viride	*verde*	*vert*	'green'
lepore	*liebre*	*lièvre*	'rabbit'
calidu	*caldo*	*chaud*	'hot'

Consonantal loss in word-final position is also common among many languages. Again, we see in French the deletion of consonants in forms such as Latin *pratu* → French *pré* via **pret*. Other word positions are also vulnerable to deletion of segments. Old and Middle English employed the cluster [kn-] as in *knight*, *knot*, *knee*; the [k] was lost between Middle and Modern English.

A change in the relative position of sounds is referred to as **metathesis**. Adjacent sounds may be affected, as in the Old English *beorht*, yielding Modern English *bright*, where CV*r*C became C*r*VC. Sounds separated by some phonetic distance may also undergo metathesis as, for example, vernacular Latin *mirac(u)lu* 'miracle' became Spanish *milagro* through the transposition of [l] and [r].

A number of other processes are often at work in sound change. Stated briefly, some further changes that affect consonants are:

aspiration	[t]	→	[tʰ]
affrication	[t]	→	[ts]
labialisation	[t]	→	[tʷ]
prenasalisation	[t]	→	[ⁿt]
glottalisation	[t]	→	[tˀ]
velarisation	[t]	→	[tˠ]
rhotacisation	[z]	→	[r]

Or, the opposite changes occur: deaspiration, deaffrication, etc. Further processes observed among vocalic segments are:

raising	[e]	→	[i]
lowering	[i]	→	[e]
fronting	[o]	→	[ø]
backing	[ø]	→	[o]
rounding	[i]	→	[y]
unrounding	[y]	→	[i]
lengthening	[a]	→	[aː]
shortening	[aː]	→	[a]
diphthongisation	[e]	→	[ie]
monophthongisation	[ie]	→	[e]

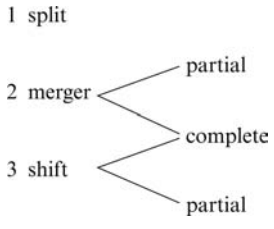
An entire syllable may also undergo loss, a process called **haplology** when a repetitive syllable is involved, cf. Latin **stipipendium* → *stipendium* 'wages'.

Change in phonological systems

As we have seen, phonemes develop variants in accordance with environmental conditions and are the result of influences exercised through phonetic processes such as assimilation. We know, for example, that English vowels have nasalised variants preceding nasal consonants, as in the word *can't*, but not in other environments, compare *cat* – phonetically (US) [kʰæ̃nt] vs. [kʰæt]. These phonetic changes have no impact

on the overall phonological system, since the variation is conditioned and predictable, affecting only the distribution of allophones [*see* PHONEMICS].

Sound changes that result in an increase or reduction in the number of phonemes in a language, or lead to the replacement of phonemes by others, are generally referred to as **splits** or **mergers**. A change in which several phonemes are replaced in a systematic way is called a shift, which also may be partial or complete:



If, in English, nasal consonants were to disappear, the form *can't* would be represented phonetically as [k^{h}ãt] and would, in fact, contrast with *cat* as /kãt/, /kæt/, with the distinguishing feature of nasal versus non-nasal vowel. What was once a phonetic feature of the language, through the loss of the nasal consonant would then become a phonemic feature brought about by phonological split. Something similar to this occurred in French, where nasal and non-nasal vowels distinguish meaning:

Latin	*French*	
bonus	*bon* /bõ/	'good'
bellus	*beau* /bo/	'pretty, handsome'

At some stage in the history of English, allophonic conditioning led to the development of a velar nasal [ŋ] before a velar plosive through assimilation. In the course of Middle English, the voiced velar plosive disappeared in word-final position after the nasal consonant, as in the words *young* or *sing*. These stages can be summarised as /sɪng/ → /sɪŋg/ → /sɪŋ/. The velar nasal allophone of /n/, then, became a separate phoneme, as evidenced by such minimal pairs [*see* PHONEMICS] as:

sin	/sɪn/
sing	/sɪŋ/

A phoneme may also split into multiple forms. Compare these developments in French:

Latin	*French*
	k/__w
/k/	s/__ [i, e]
	ʃ/__a

in such words as:

Latin	*French*	
quando	*quand* /kã/	'when'
centum	*cent* /sã/	'hundred'
campus	*champ* /ʃã/	'field'

Phonological split may also result in merger in which no new phonemes are created in the language. In most dialects of American English, for example, /t/ split into the voiceless stop [t] and the voiced flap [ɾ] in certain environments and [ɾ] merged with the similarly arising allophonic flap associated with the phoneme /d/. This gave rise to the homophony of *latter* with *ladder* and *bitter* with *bidder*.

Mergers may be **partial** or **complete**. If merger is complete, there is a net reduction in the number of phonemes in the language. Such is the case in some varieties of the non-standard London dialect Cockney (among many other dialects of English), where the two dental fricatives /θ/ and /ð/ have merged completely with /f/ and /v/, respectively. Hence, *thin* /θɪn/ is pronounced /fɪn/ and *bathe* /beɪð/ is pronounced /beɪv/. Four phonemes were reduced to two:

/f/	/θ/	→	/f/
/v/	/ð/	→	/v/

In African-American Vernacular English pronunciation in the USA, /θ/ merges partially with /f/, i.e. /θ/ → /f/ in all positions except word-initial. The form *with* is articulated as /wɪf/ but the word *thing* retains /θ/ as in /θɪŋ/ or /θæŋ/.

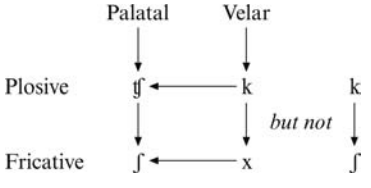
When a series of phonemes is systematically modified, such as /p/, /t/, /k/ → /b/, /d/, /g/, we may consider a wholesale shift to have occurred. A shift may be **partial**, when all the allophones of the phoneme do not participate in it, or it may be **complete**, when they do. The modification of long vowels in Late Middle English known as the **Great English Vowel**

Shift (see below) left no residue and appears to have been complete. The **First Germanic Consonant Shift**, in which /p/, /t/, /k/ → /f/, /θ/, /x/, however, left some of the voiceless plosives unaffected in specific environments, such as after /s/. Compare, for example, Latin *est* and German *ist* and see above.

Phonological processes that lead to allophonic variation and subsequent new phonemes generally occur one step at a time. The change of Latin /k/ to French /ʃ/, for example, in words such as *cane* /kane/ to *chien* /ʃjɛ̃/, did not happen directly, but instead involved two changes:

/k/ voiceless	→ /ʧ/ voiceless	→ /ʃ/ voiceless
plosive	plosive	fricative
velar	palatal	palatal

Phonological change usually takes place within the range of allophonic variation that varies by one feature. A phoneme /k/ might have allophones [t] or [x], which differ by one phonological feature, but not generally an allophone /ʃ/, which differs by two features. A change to /ʃ/ could be the result of either of the two allophones serving as intermediaries:



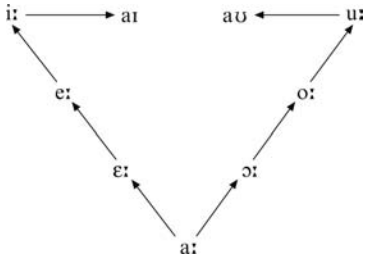
Non-phonologically motivated changes in pronunciation

Many phonological changes are not conditioned by the surrounding phonetic environments but are motivated by other factors relating to external forces, such as substratum influences, and internal forces inherent in the structural paradigmatic make-up of the language; it is often the case, however, that, obscured by time, these factors are no longer readily recoverable (though reasonable inferences can often be drawn on the basis of our knowledge of general patterns of language change). The **First Germanic Consonant Shift**, for example, occurred at a time in which there were no written records for the Germanic languages and under unknown circumstances.

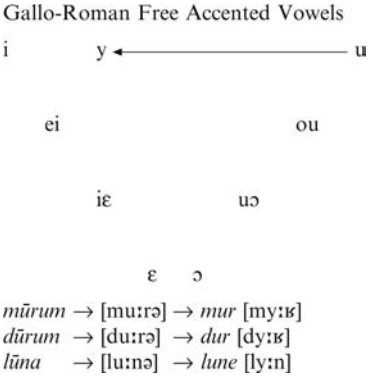
A major change in the history of English vowels took place at the end of the Middle English period (sixteenth century), in which the long tense vowels underwent a regular modification without the apparent assistance of an environmental stimulus. The modification is referred to as the **Great English Vowel Shift**.

Middle English	*Early Modern English*	
[miːs]	[maɪs]	'mice'
[muːs]	[maʊs]	'mouse'
[jeːs]	[giːs]	'geese'
[joːs]	[guːs]	'goose'
[brɛːken]	[breːk]	'break'
[brɔːken]	[broːk]	'broke'
[naːm]	[neːm]	'name'

The vocalic movement upward in which the high vowels diphthongised can be shown schematically as:



An upward pressure was also exerted on the back vowels of the Gallo-Roman language in about the ninth century during their evolution from Latin to French, and the high back vowel from Latin [uː], which had become [u], then shifted to [y].



Note [u] → [y] regardless of environmental position, so that explanations other than those involving conditioned change must be sought. One plausible interpretation of the event, based on paradigmatic considerations, suggests that, with the monophthongisation of Latin [au] → [ɔ] (*aurum* → *or* [ɔr]), which occurred prior to the change [u] → [y], the margin of tolerance, i.e. the physical space, between back vowels was not sufficient. The monophthongisation of [au] consequently forced upward pressure on the back vowels, and [u], the highest vowel, could go no higher and fronted.

The plosive and fricative consonantal structure of Early Old French of the eleventh and twelfth centuries consisted of the following phonetic inventory and relationships:

		Labial	*Dental*	*Pre-palatal*
Plosives	vl	p	t	ts
	vd	b	d	dz
		Palatal	*Velar*	
	vl	ʧ	k	
	vd	ʤ	g	
Fricatives	vl	f	s	
	vd	v	z	

(vl = voiceless; vd = voiced)

During the thirteenth century, the affricated palatal sounds became fricatives:

ć [ts] → s
ź [dz] → z
č [ʧ] → ʃ
ǧ [ʤ] → ʒ

The result of these changes was a later Old French system of consonantal sounds as follows:

p	t		k
b	d		g
f	s	ʃ	
v	z	ʒ	

The rationale for these changes has been sought in a tendency to reduce the overcrowded palatal zone and a leaning towards symmetry by reducing the five orders (labials, dentals, etc.) to four in accordance with the four series of plosives and fricatives.

In other attempts to explain phonological modifications that fall outside the realm of conditioned change, the notion of **substratum influence** has often been invoked. Certain words in Spanish, for example, developed an [h] (which has been lost in the modern language in pronunciation, but is still reflected in the orthography) where Latin had [f].

Latin	*Spanish*	
filium	*hijo* [ixo]	'son'
fabam	*haba* [áβa]	'bean'
folia	*hoja* [óxa]	'leaf'
feminam	*hembra* [émbra]	'female'
fumum	*humo* [úmo]	'smoke'

As the replacement of Latin [f] by [h] began in the north of the peninsula, where the Basques were in contact with Hispano-Roman speakers, and because Basque had no [f] sound, the hypothesis has been put forward that Basque speakers, upon learning the Hispano-Roman language, substituted their closest sound. According to this view, this sound was [ph] which subsequently became [h]. Those words not affected (cf. Latin *florem*, which became Spanish *flor*) were excluded from the change due to other factors, such as learned influences.

Diffusion of language change

Besides the study of mechanisms and processes of language change, the historical linguist must also be concerned with how changes spread throughout a speech community, as that too is part of the change's history. The vocabulary of a language may be modified by **lexical diffusion** in which a change begins in one or several words and gradually spreads in an essentially analogical fashion from word to word, with one serving as the model for the next, throughout the relevant portions of the lexicon. This therefore would be another non-phonologically motivated change in the pronunciation of a word. One such ongoing change can be seen in words such as *present*, which can be used as either a verb or a noun. At one time all such words were accented on the second syllable regardless of their status as noun or verb. In the period that gave rise to Modern English (sixteenth century), words such as *rebel*, *outlaw* and *record* began to be pronounced with the accent on the first syllable when they were used as nouns. Over the next few centuries

more and more words followed the same pattern, cf. *récess* and *recéss*, *áffix* and *affíx*. The diffusion process is still in progress, however, as indicated by the fact that many English speakers say *addréss* for both noun and verb and others use *áddress* as the noun and *addréss* for the verb. There are still many words that have as yet not been affected by the change, compare *repórt*, *mistáke* and *suppórt*.

Not all changes diffuse gradually through the lexicon. Some changes, especially sound change proper, affect all words in a given class at the same time. In some Andalusian dialects of Spanish, the phoneme /s/ has developed an allophone [h] in syllable-final position:

Standard pronunciation	*Andalusian*
[dos]	[doh]
[es]	[eh]
[mas]	[mah]

The change is regular and systematic, affecting all instances of syllable-final /s/ in the speech patterns of the individuals who speak this dialect.

Along with linguistic diffusion of change throughout the lexicon of the language, the linguist may also take into account diffusion of change throughout the speech community. A given speech modification begins in the speech habits of one or several individuals and spreads (if it spreads at all) to an ever-increasing number of people (a process that can be thought of as a kind of borrowing between dialects, with each speaker representing a 'dialect', that is, idiolect). Whether or not diffusion occurs may depend on the relative prestige of the people who initiate the change and their influence on the speech population, and on speakers' choices (largely unconscious) to model their speech on that of others they emulate or want to identify with (in the manner demonstrated by Labov 1963). If the prestige factor is high, there is a good chance that the innovation will be imitated by others. The loss of postvocalic /r/ in some eastern dialects of the USA was due to a change that originated in England and was brought to the New World by new settlers. Similarly, the adoption of the sound /θ/ in southern Spain (where no such sound existed) by speakers of the Andalusian dialect is due to their imitation of Castilian Spanish, the prestige dialect of Madrid and its surroundings.

Morphological and syntactic change

Effects of sound change on morphology

The effect of phonological change on aspects of morphology is evident in the restructuring of the plural forms in some English words:

	Germanic	*Old English*	*Modern English*
Sing	*mūs	mūs	[maʊs] 'mouse'
Pl	*mūsi	mīs	[maɪs] 'mice'
Sing	*fōt	fōt	[fʊt] 'foot'
Pl	*fōti	fēt	[fit] 'feet'

In these and examples like them, the process of **umlaut** or **mutation** operated to change the stem vowel [uː] → [iː] and [oː] → [eː] through the fronting influence of a following close front [i] which then disappeared. Subsequently, [iː] became [aɪ] and [eː] became [i] (see above), so that the modern forms show a phonetically unmotivated vowel change in the plural.

The influence of sound change on morphological structures may also be seen in the Old English system of nominal forms whose suffixes marked case and gender. Compare the Old English masculine noun *hund* 'dog'.

Old English

	Singular	*Plural*
Nom	hund	hund-as
Acc	hund	hund-as
Gen	hund-es	hund-a
Dat	hund-e	hund-um

Other nouns belonged to either masculine, feminine or neuter types distinguished on the basis of case endings, e.g., feminine *gief* 'gift' declined along the lines of *gief-u* in the nominative singular, *gief-e* in the accusative singular, etc.

Through phonological change, the case and gender distinctions of Old English were lost. By the fifteenth century, the /m/ of the dative plural suffix had been effaced and unaccented vowels of the case endings had been reduced to /ə/.

Middle English

	Singular	*Plural*
Nom	hund	hund-əs
Acc	hund	hund-əs
Gen	hund-əs	hund-ə
Dat	hund-ə	hund-ə

Previous distinctions between dative singular and dative plural, genitive singular and nominative plural, and so on, disappeared.

The distinction between singular and plural forms in Middle English was preserved by the continuance of the phoneme /s/, which survived also to mark the genitive singular forms. A genitive plural /s/ was added by analogy with the singular. The loss of case endings also obliterated the gender distinctions that were found among Old English forms. Sound change further modified the internal structure of morphemes such as *hund*, subject to the result of the Great English Vowel Shift, which diphthongised /u/ to /aʊ/ and resulted in:

Present-day English			
Singular		*Plural*	
hound	/haʊnd/	hounds	/haʊndz/
hound's	/haʊndz/	hounds'	/haʊndz/

Another such instance is the development of Latin into the Romance languages. Classical Latin contained six cases, which were reduced in the vernacular Latin speech of the Empire, and finally disappeared altogether in the Romance languages, with the exception of Romanian. Increasing stress patterns in Popular Latin gradually neutralised the differences between long and short vowels by creating long vowels in accented syllables and short vowels in unaccented syllables regardless of the original arrangement. With the concomitant loss of final *-m* in the accusative (by a regular sound change affecting final [m] in polysyllables), the nominative, vocative, accusative and ablative forms merged. The genitive and dative conformed to the rest of the pattern by analogy.

As in English, the loss of the case system brought on a more extensive and frequent use of prepositions and a more rigid word order to designate the relationships formerly employed by case functions.

	Classical Latin	*Popular Latin*	*French*
Sing			
Nom	*porta*	*porta*	*la porte*
Voc	*porta*	*porta*	*la porte*
Acc	*portam*	*porta*	*la porte*
Gen	*portae*	*de porta*	*de la porte*
Dat	*portae*	*ad porta*	*à la porte*
Abl	*portā*	*cum porta*	*avec la porte*

Word order, prepositions and articles

The developments of the Latin case system as the Romance dialects emerged provide a clear example of syntactic change. As long as relationships within a sentence were signalled by case endings, the meaning of the sentence was unambiguous. Compare the following Latin sentences.

Poeta puellam amat.
Puellam poeta amat. 'The poet loves the girl'
Poeta amat puellam.
Puellam amat poeta.

With the loss of case endings such as the accusative singular marker *-m*, subject and object would have become indistinguishable.

**Poeta puella amat.*
**Puella poeta amat.*

Consequently, one of the word orders, that in which the subject preceded the verb and the object followed, became fixed: *Poeta ama puella.*

This word order has persisted into the Romance languages, accompanied by the use of articles developed from Latin demonstratives (a further – and a rather common – morpho-syntactic and semantic innovation), and in Spanish by a preposition, *a*, to indicate personalised objects:

French	*Le poète aime la jeune fille.*
Spanish	*El poeta ama a la muchacha.*
Italian	*Il poeta ama la ragazza.*

More extensive use of prepositions also became an important factor in signalling other case relations such as possession, location, etc.:

Latin	*Puella rosam poetae in porta videt.*
French	*La jeune fille voit la rose du poète à la porte.*
Spanish	*La muchacha ve la rosa del poeta en la puerta.*
English	*The girl sees the poet's rose on the door.*

The changing phonological conditions in the Latin of the Empire also had a profound effect

on verbal forms. For example, compare Latin and French:

	Latin	*Old French*	*French*
Sing			
1	*cantō*	*chant(e)* [ʃãnt(ə)]	*chante* [ʃãt]
2	*cantas*	*chantes* [ʃãntəs]	*chantes* [ʃãt]
3	*cantat*	*chante* [ʃãntə]	*chante* [ʃãt]

The first-person singular [o] was lost, as were final consonants, and final unaccented vowels were weakened to [ə]. In the first-person singular an analogical [ə] was added by the fourteenth century.

The merger of verb forms in the French paradigm through sound change necessitated some manner of differentiating them according to person and led to the obligatory use of subject pronouns.

je chante
tu chantes
il chante

As the verb forms were clearly distinguishable in Latin by the endings, there was no need to employ subject pronouns except in special cases, a situation still to be found in languages such as Spanish and Italian:

	Spanish	*Italian*
1	*canto*	*canto*
2	*cantas*	*canti*
3	*canta*	*canta*

Not unlike sound change proper, morphological changes may proceed on a regular and systematic basis. The Latin **synthetic future**, for example, *cantabo*, 'I will sing', disappeared in all forms and was replaced by a new **periphrastic future** consisting of a verbal infinitive with *habeo* 'have' as an auxiliary; various reductions have led essentially to a new synthetic future in Romance languages, with new grammatical marking for future tense, for example, *cantare habeo* → *chanterai* [ʃãtre].

Analogical change

The effects of sound change may be offset by analogical formations that regularise forms on the basis of others in the paradigm. As discussed earlier, accented [á] in Latin became [ɛ] in French, as we see again in the following paradigm.

	Latin	*Old French*	*French*
Singular			
1	*ámo*	*aim(e)*	*aime* [ɛm]
2	*ámas*	*aimes*	*aimes* [ɛm]
3	*ámat*	*aime*	*aime* [ɛm]
Plural			
1	*amámus*	*amons*	*aimons* [ɛmõ]
2	*amátis*	*amez*	*aimez* [ɛme]
3	*ámant*	*aiment*	*aiment* [ɛm]

These forms undergo regular sound change into Old French, in which initial accented [a] became [ɛ] but remained as [a] in the first- and second-person plural, where it was in unaccented position. This led to an irregular (i.e. non-uniform) paradigm. During the transition from Old French to Modern French, however, the paradigm was regularised through analogy with the singular and third-person plural forms, obscuring the effects of the regular sound change and resulting in a uniform paradigm. Similarly, an orthographic *e* (cf. also *chante* in the previous section) was added to the first-person singular to conform with the rest of the paradigm.

In addition to paradigm-internal analogy, analogical pressures can be exerted from outside the paradigm. An example in Old English is the word for *son*.

	Singular	*Plural*
Nom	*sunu* 'son'	*suna* 'sons'
Acc	*sunu*	*suna*
Dat	*suna*	*sunum*
Gen	*suna*	*suna*

The plural forms had no [s] but the word has become *sons* in Modern English by analogy with other words that did make the plural with *s*, such as *bāt* (nom. sing.) and *bātas* (nom. plur.) which became *boat* and *boats*, respectively.

When sound change threatens to eliminate a well-entrenched grammatical category such as, for instance, singular and plural in Indo-European languages, adjustments may occur that preserve the category (albeit in a new phonological form). The previously mentioned loss of syllable- and word-final [s] in some dialects of Andalusian

Spanish, for example, also swept away the earlier plural marker in [s]. For example, compare:

Castilian		*Andalusian (Eastern)*	
Singular	*Plural*	*Singular*	*Plural*
libro	*libros*	*libro*	*libro*
gato	*gatos*	*gato*	*gatɔ*
madre	*madres*	*madre*	*madrɛ*
bote	*botes*	*bote*	*botɛ*

In compensation for the loss of the plural indicator [s], the final vowel of the word opened (lowered a degree), and the vowel lowering now indicates plurality.

Morphological differentiation was also a factor in the modifications of the second-person singular of the verb *to be* in the Romance languages. The distinction of second and third person in vernacular Latin was threatened by the loss of word-final /-t/; compare:

Latin	*sum*		
	es	→	*es*
	est	→	*es(t)*

The various Romance languages resorted to different strategies to maintain the distinction between the second- and third-persons singular. French distinguished them on the basis of pronouns that were obligatory in the language; Spanish borrowed a form from another part of the grammar no longer needed, namely the disappearing synthetic future; and Italian resorted to analogy of the second person with that of the first person by adding /s-/. For example, compare:

French	*Spanish*	*Italian*
je suis	*soy*	*sono*
tu es [ɛ]	*eres*	*sei*
il est [ɛ]	*es*	*è*

Some syntactic changes appear to be unmotivated by modifications in the phonological or morphological component of the grammar. In Old and Middle English, an inversion rule relating to the formation of Yes/No questions could apply to all verbs – for example, *They speak the truth* and *Speak they the truth?* During the sixteenth and seventeenth centuries, the rule changed to apply to a more limited set of verbs, those that function as auxiliaries. Disregarding the fact that the verbs *be* and *have* undergo an inversion even when they do not perform as auxiliaries, and ignoring here the details of the emergence of the auxiliary verb *do*, the change can be shown as follows:

Old construction	They speak.	→	Speak they?
	They can speak.	→	Can they speak?
New construction	They speak.	→	*Speak they? (replaced by Do they speak?)
	They can speak.	→	Can they speak?

Historical linguistics has only in recent years begun to investigate syntactic change in a systematic manner in conjunction with developments in the field of synchronic syntactic studies.

Lexical and semantic change

Besides changes in the grammar of language, modifications also occur in the vocabulary, both in the stock of words (**lexical change**) and in their meanings (**semantic change**). Words may be added or lost in conjunction with cultural changes. The many hundreds of words that once dealt with astrology, when the art of divination based on the stars and their supposed influence on human affairs was more in vogue, have largely disappeared from the world's languages, while large numbers of new words related to technological developments are constantly revitalising their vocabularies.

Some of the word-formation processes and other sources of lexical changes in English are:

compounding:	sailboat, bigmouth;
derivation:	uglification, finalise;
borrowing:	yacht (Dutch), pogrom (Russian);
acronyms:	UNESCO, RADAR;
blending:	smoke + fog → smog; motor + hotel → motel;
abbreviation:	*op. cit.*, *ibid.*, Ms.;
doublets:	person, parson;
back formation:	typewrite ← typewriter, burgle ← burglar;
echoic forms and inventions:	miaow, moo, splash, ping;

clipping:	prof *for* professor, phone *for* telephone;
proper names:	sandwich ← Earl of Sandwich (1718–92); boycott ← Charles Boycott (1832–97).

Changes in the meanings of words constantly occur in all natural languages and revolve around three general principles: **semantic broadening**, that is, from the particular to the general, e.g., *holy day* → *holiday*, Old English *dogge*, a specific breed → *dog*; **semantic narrowing**, from the general to the particular, e.g., Old English *mete* 'food' → *meat*, a specific food, i.e. flesh, Old English *steorfan* 'to die' → *starve*; and **semantic shift**, e.g., *lust* used to mean 'pleasure', *immoral* 'not customary', *silly* 'happy, blessed', *lewd* 'ignorant'.

The etymological meaning of a word may help to determine its current meaning. English words such as *television* or *telephone* can be deduced from their earlier Greek and Latin meanings with respect to the components (*tele* 'at a distance', *vision* 'see', *phone* 'sound'). Such is not always the case, however. Borrowed words as well as native forms may undergo semantic change so that etymological knowledge of a word may not be sufficient to assess its meaning. Compare the following:

English	*Latin*	
dilapidated	*lapis*	'stone'
eradicate	*radix*	'root'
sinister	*sinister*	'left'
virtue	*vir*	'man'

From the origin of *dilapidated*, it might be thought that it referred only to stone structures; *eradicate*, only to roots; *sinister*, to left-handed people; and *virtue*, only to men.

Words, then, do not have immutable meanings that exist apart from context. They tend to wander away from earlier meanings and their semantic values are not necessarily clear from historical knowledge of the word.

Changes in the material culture, sometimes called **referent change**, have an effect on the meaning of a word, as is the case of the English word *pen*, which once meant 'feather' (from a root **pet* 'to fly'). This name was appropriate when quills were used for writing but remained when pens were no longer feathers. Similarly, the word *paper* is no longer associated with the papyrus plant of its origin.

Social and cognitive aspects of language change

As the earlier discussion of the diffusion of change suggests, social factors such as prestige and group identity can play an important role in language change. Social factors come into play in other ways too. For instance, language change often comes about through the socially motivated phenomena of **taboos**, **metaphor** and **folk etymologies**. The avoidance of particular words for social reasons seems to occur in all languages and **euphemisms** arise in their place. For instance, instead of *dies* one may use the expression *passes away*, which seems less severe and more sympathetic. Or one *goes to the bathroom* instead of the *toilet*, but does not expect to take a bath – even dogs and cats may go to the bathroom in North America. Elderly people are *senior citizens* and the poor are *underprivileged*. Like all social phenomena, taboos change with time and viewpoint. In Victorian England the use of the word *leg* was considered indiscreet, even when referring to a piano.

Taboos may even cause the loss of a word, as in the classical Indo-European case of the word for 'bear'. A comparison of this word in various Indo-European languages yields:

Latin	*ursus*	Old Church Slavonic	*medvedĭ*
Greek	*arktos*	English	*bear*
Sanskrit	*ṛkṣaḥ*	German	*Bär*

The presumed Indo-European ancestor of the Latin, Greek and Sanskrit forms was *Hṛk'þos. Avoidance of the term is thought to have occurred in the northern Indo-European regions, where the bear was prevalent, and another name (employed, perhaps, not to offend it or as part of a hunting taboo against speaking the name of the prey) was substituted in the form of Proto-Germanic **ber-* 'brown', that is, 'the brown one'. In Slavic the name invoked was *medved-*, from Indo-European **medhu* 'honey' and **ed* 'to eat', that is, 'honey-eater'.

Taboo may also account for seeming irregularities in phonological change. The name of the

Spanish town of Mérida, for example, did not undergo the usual syncope of the post-tonic vowel as did other Spanish words of the *veride* → *verde* 'green' type, presumably because the result would have been *Merda* 'dung', a word that would have inspired little civic pride.

Unaccustomed morphological shapes in a given language are often replaced by more familiar ones through a cognitively based process of **reinterpretation**. Loan words are readily subject to this process, as they are often unfamiliar in the adopting language. Reinterpretation of forms typically involves making a connection with phonetically and semantically similar forms already in the language, a process generally known as **folk etymology**, in that speakers impose an analysis on (i.e. give a synchronic etymology – or parsing – for) these otherwise unanalysable forms. One example involves the Middle English word *schamfast*, which meant in Old English 'modest', that is, 'firm in modesty'. To make the word readily parsable, the infrequent form *fast* (in the meaning found in *hold fast*) was changed to *face* and the word came to be *shamefaced*. Middle English *berfrey* 'tower', with nothing to do with *bell*, has become *belfry* and is associated with a *bell tower*. Words may also change their shapes due to resegmentation, such as Middle English *a napron*, which was misconstrued as *an apron* so that the noun became *apron*. Similarly, Middle English *nadder* became *adder*.

Among other characteristics of variation or style in language that may lead to semantic change (metonymy, synecdoche, hyperbole, emphasis, etc.), **metaphor**, a kind of semantic analogy, appears to be one of the most important aspects of linguistic behaviour. It involves a cognitive transfer through a similarity in sense perceptions. Expressions already existent in the language are often usurped, giving rise to new meanings for old words – for example *a galaxy of beauties*, *skyscraper*. Transfer of meanings from one sensory faculty to another occurs in such phrases as *loud colours*, *sweet music*, *cold reception*, and so on.

Linguistic borrowing

The possible effects of contact between speakers of different languages must be considered in any aspect of language change. When a community of speakers incorporates some linguistic element into its language from another language, **linguistic borrowing** occurs. Such transferences are most common in the realm of vocabulary, where words may come in and disappear with little consequence for the rest of the grammar. The borrowing language may incorporate some cultural item or idea and the name along with it from some external source; for example, Hungarian *goulash* and Mexican Spanish *enchilada* were taken into English through borrowings, and the words *llama* and *wigwam* were adapted from American Indian languages.

When words are borrowed, they are generally made to conform to the sound patterns of the borrowing language. The German word *Bach* [bax], which contained a voiceless velar fricative [x], a sound lacking in most English dialects, was incorporated into English as [bɑk]. English speakers adopted the pronunciation with [k] as the nearest equivalent to German [x]. In Turkish, a word may not begin with a sound [s] plus a plosive consonant. If such a word is borrowed, Turkish speakers added a prothetic [i] to break up the troublesome cluster. English *scotch* became Turkish [iskoʧ] and French *station* appears in Turkish as [istasjon]. Latin loan words in Basque encountered a similar kind of reconditioning: Latin *rege* became Basque *errege*, inasmuch as Basque words did not contain a word-initial [r-].

Only in relatively rare instances are sounds or sequences of sounds alien to the adopting language borrowed. The word-initial consonant cluster [kn-] does not occur in native English words, having been reduced to [n] in the past and persisting only in the orthography, but the word *knesset* 'Israeli parliament' from Hebrew has been taken over intact.

Borrowing is one of the primary forces behind changes in the lexicon of many languages. In English, its effects have been substantial, as is particularly evident in the extent to which the common language was influenced by Norman French, which brought hundreds of words into the language relating to every aspect of social and economic spheres, e.g.:

> *Government and social order:* religion, sermon, prayer, faith, divine;

Law: justice, crime, judge, verdict, sentence;
Arts: art, music, painting, poet, grammar;
Cuisine: venison, salad, boil, supper, dinner.

For the historical linguist, borrowings often supply evidence of cultural contacts where vocabulary items cannot be accounted for by other means. The ancient Greeks, for example, acquired a few non-Indo-European words, such as *basileus* 'king' and *plinthos* 'brick', presumably from a pre-Indo-European substrate language of the Hellenic Peninsula, along with certain non-Indo-European suffixes such as *-énai* in *Athénai*.

Onomastic forms, especially those relating to **toponyms** such as names of rivers, towns and regions, are especially resistant to change and are often taken over by a new culture from an older one. Compare, for example, *Thames*, *Dover* and *Cornwall*, incorporated into Old English from Celtic, and American and Canadian geographical names such as *Utah*, *Skookumchuck* and Lake *Minnewanka*.

A sampling of the broad range of sources that have contributed to the English lexicon is: *bandana* (Hindustani), *gimmick* (German), *igloo* (Inuktitut [Eskimo]), *kamikaze* (Japanese), *ukulele* (Hawaiian), *zebra* (Bantu), *canyon* (Spanish), *henna* (Arabic), *dengue* (Swahili), *lilac* (Persian), *xylophone* (Greek), *rocket* (Italian), *nougat* (Provençal), *yen* (Chinese), and many others.

The social contexts in which linguistic borrowing occurs have often been referred to as the **substratum**, **adstratum** and **superstratum**. When a community of speakers learns a new language that has been superimposed upon them, as would have been the case when Latin spread to the provinces of Spain or Gaul, and carry traces of their native language into the new language, we have what is commonly called **substratum influence**. The French numerical system's partially reflecting multiples of twenty, for example, may have been retained from the Celtic languages spoken in Gaul prior to the Roman occupation, that is, from the Celtic substratum. **Adstratum influence** refers to linguistic borrowing across cultural and linguistic boundaries as would be found, for example, between French and Spanish, or French and Italian or German. Many words for items not found in the cultures of English colonists in America were borrowed from the local Indians under adstratum conditions, such as *chipmunk* and *opossum*. Influences emanating from the **superstratum** are those in which linguistic traits are carried over to the native or local language of a region as the speakers of a superimposed language give up their speech and adopt the vernacular already spoken in the area. Such would have been the case when the French invaders of England gradually acquired English, bringing into the English language a number of French terms.

The degree of borrowing from language to language or dialect to dialect can be related to the perceived prestige of the lending speech. Romans, great admirers of the Greeks, borrowed many words from this source, while the Germanic tribes in contact with the Romans took up many Latin words. The English also borrowed greatly from the French after the Norman Conquest, when the French aristocracy were the overlords of England.

Sometimes only the meaning of a foreign word or expression is borrowed and the word or words are translated in the borrowing. Such conditions are referred to as **loan translations**. The English expression *flea market* is a translation of the French *marché aux puces*. The word *telephone* was taken into German as a loan translation in the form of *Fernsprecher*, combining the elements *fern* 'distant' and *Sprecher* 'speaker'.

While borrowing across linguistic boundaries is primarily a matter of vocabulary, other features of language may also be taken over by a borrowing language. It has been suggested that the employment of the preposition *of* plus a noun phrase to express possession in English, e.g., *the tail of the cat* versus *the cat's tail*, resulted from French influence: *la queue du chat*. In parts of France adjoining Germany, the adjective has come to precede the noun, unlike normal French word order. This is due to German influence, e.g., *la voiture rouge* 'the red car' has become *la rouge voiture* (cf. German *das rote Auto*). Such structural borrowing is especially evident in cases of sustained intimate contact involving bi- or multilingualism, where structures from one language a speaker uses 'bleed' over into the other language. The spread of finite (person-marked) subordinate clauses in languages of the Balkans (Greek, Albanian, Bulgarian, Macedonian, etc.) is a case in point.

Language reconstruction

The systematic comparison of two or more languages may lead to an understanding of the relationship between them and indicate whether or not they descended from a common parent language. The most reliable criterion for this kind of genetic relationship is the existence of systematic phonetic congruences in specific morphemes coupled with semantic similarities. Since the relationship between form and meaning of words in any language is arbitrary, and since sound change is reflected regularly throughout the vocabulary of a given language, the existence of concordances between related languages, or lack thereof, becomes discernible through comparisons. Languages that are genetically related show a number of **cognates** – that is, related words in different languages that descend from a common source.

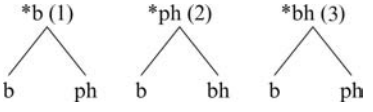
When the existence of a relationship has been determined, the investigator may then work with cognate forms to reconstruct the earlier form of the relevant languages, or the common parent, referred to as the proto-language, in order to extend the knowledge of the language in question back in time, often even before written documentation. Reconstruction makes use of two broad strategies: the phoneme that occurs in the largest number of cognate forms is the most likely candidate for reconstruction in the proto-language (this is a special case of Occam's Razor, a principle of scientific investigation that says to choose the simplest solution, all things being equal); and the changes from the proto-language into the observable data of the languages in question are plausible only to the extent that such changes can be observed in languages currently spoken or derived from well-known phonetic principles.

A phoneme that occurs in the majority of the languages under consideration but nevertheless cannot be accounted for in the daughter language by a transition from the proto-language based on sound linguistic principles should not be posited in the proto-form. For example, if a majority of languages had the sound [ʧ] and a minority contained [k] in both cases before the vowel [i], one would reconstruct the phoneme /k/ and not /ʧ/, by virtue of the fact that /k/ before /i/ has often been seen to become /ʧ/, while the reverse seems never to occur or at least is phonetically unlikely.

Thus, there are cases where it may not be reliable to use a statistical method. Given the following languages and cognate forms:

Sanskrit	*bharāmi*	bh-
Greek	*pherō*	ph-
Gothic	*baira*	b-
English	*bear*	b-
Armenian	*berem*	b-

the predominance of [b-] suggests that it is the most likely candidate for the **proto-sound**. On the other hand, assuming that the simplest description is the best one and that phonological change occurs one step at a time, we might note that, given the various possibilities,



changes (1) and (2) require at least two steps to derive one of the reflexes ([b] → [p] → [ph], [ph] → [p] → [b]), while change (3) requires only one step for each reflex, i.e. loss of aspiration and devoicing, respectively. The sound [bh-] appears to be the logical candidate for the proto-sound based on Occam's Razor. Further enquiry would also show that Gothic and English reflect a common stage with [b-]; that is, one has to take sub-grouping of related languages into consideration. The predominance of [b-] in three of the five languages is then somewhat deceptive in terms of comparative reconstruction.

Latin	*pēs*
Greek	*pous*
Sanskrit	*pad-*
Old High German	*fuoz*
Old English	*fōt*
Church Slavonic	*noga*

If we compare the words for *foot* in the Indo-European languages, we could disregard the form *noga*, given its considerable distance phonetically from the other putative cognates, as being from another source (actually, it once meant 'claw') and consider either *[p] or *[f] as the initial proto-sound. As the Germanic branch

of Indo-European has [f] where other languages have [p], we posit the proto-sound as *[p] and deduce a shift from *[p] to [f] in Germanic.

Through examination of the vocabulary of other related languages of the Indo-European family, such as Umbrian *peři* 'foot', Latvian *peda* 'sole of foot', Church Slavonic *pesi* 'on foot', we could posit the proto-vowel as *[e].

Considerations in establishing the earlier form of the final consonant might come from the Latin genitive form *pedis*, from the Greek genitive *podos*, Gothic and Old English *fōt*, among others. The proto-consonant in root-final position seems certain to have been a dental plosive ([t̪] or [d̪]). Noting that Germanic languages generally have [t] where other Indo-European languages (Latin, Greek, Sanskrit) have [d], compare Latin *decem*, Greek *deka*, Sanskrit *daśa* and English *ten*, we might conclude that the proto-language had *[d], which became [t] in Germanic. The proto-word for *foot* can now be constituted as *[ped-], a non-attested hypothetical construct posited for the proto-language.

In reconstructing the phonological forms of an earlier language, the linguist will also be concerned with the possible motivating factors underlying the change as these will often give some insight into the direction of the modification and ultimately help to establish the proto-form. Among the following Romance words one can readily see the influence exerted by environmental conditions that led to modifications in some of the languages.

Spanish	*Portuguese*	*Italian*	
agudo	*agudo*	*acuto*	'acute'
amigo	*amigo*	*amico*	'friend'

The appearance of voiced plosives [b, d, g] in earlier Spanish and Portuguese, contrasted with their voiceless counterparts in Italian, suggests that the voiced surrounding (between vowels) gave rise to the voiced consonants and that Italian has preserved here a more conservative or older stage of the language. There is no obvious motivation for the process to have occurred the other way around, with the voiced sounds becoming voiceless in voiced surroundings.

Some features of a proto-language are beyond recovery through reconstruction. The identification of proto-sounds or grammatical and syntactic characteristics of an unwritten parent language after complete loss through merger or other means in the descendent languages may simply not be possible. Without written records of the period, we could not identify or reconstitute vowel quantity in proto-Romance (Latin) speech. The phonological distinctiveness of vowel quantity in Latin is obvious from such words as *dĭcō* 'I dedicate' and *dīcō* 'I say', but the modern descendent languages display no such oppositions in vowel quantity.

Similarly, the proto-language, Latin, had a system of **synthetic passive** forms, e.g., *amor*, *amaris*, *amatur*, etc., 'be loved', which left no trace in the Romance languages, where **analytic passives** developed as in Spanish *soy amado* and French *je suis aimé* 'I am loved', in conjunction with the Latin verb *esse* 'to be' and the past participle of the main verb. Without written records, the synthetic constructions in Latin, the Romance proto-language, would remain virtually undetected.

While the **comparative method** is the most powerful tool for reconstruction, another – **internal reconstruction** – may be utilised when comparative information is not available, or when the goal is to reconstruct earlier forms of a single language. The primary assumption underlying internal reconstruction is that many events in the history of a language leave discernible traces in later stages of the language. An examination of these traces can lead to a reconstruction of linguistic processes of change and thus to a reconstructed form of the language prior to events that changed it. By way of example, we can look at a few related forms in Spanish from the point of view of internal methods.

[nótʃe]	*noche*	'night'	[nokturnál]	'nocturnal'
[ótʃo]	*ocho*	'eight'	[oktagonál]	'octagonal'
[dítʃo]	*dicho*	'said'	[diktaθjón]	'dictation'

There is an alternation among these related words between [tʃ] ~ [kt] but no apparent motivation for a change such as [tʃ] → [kt], while, on the other hand, [kt] → [tʃ] would not be unexpected. The velar [k] was pulled forward into the palatal zone by anticipation of dental [t] (assimilation) to become [j] and then the [t] was palatalised by the preceding [j], i.e. [kt] → [jt] → [tʃ]. We can now reconstruct the forms in [tʃ] as [kt]:

*nókte
*ókto
*díkto

The undeciphered ancient Iberian language of Spain's Mediterranean coasts, known only from inscriptions and not yet found to be related to any other language, contains the following lexical forms:

baite	*baikar*
baiti	*bainybar*
baitolo	*baituṛane*

Since the sequences *kar* and *-nybar* appear in other words, they are assumed to be separate morphemes; compare *balkar*, *antalskar*.

This suggests an alternation between *bait* and *bai*, in which the forms (allomorphs) occur as follows:

bait + vowel
bai + consonant

or

bait → *bai*/ _consonant

We are now in a position to reconstruct **baitkar* as an earlier form of *baikar*,**baitnybar* as an earlier form of *bainybar*.

The reduction of the sequences *[tk] to [k], *[tn] to [n], [tt] to [t], is in accordance with the phonotactics of Iberian, which does not display sequences of plosive plus consonant as part of the language.

The results of this method of internal reconstruction are not verifiable, however, unless corroborating evidence can be found. In this case, we note that Basque has a form *bait* which, when combined with *-gare*, becomes *baikare*, similarly, *bait-nago* → *bainago*, *bait-du* → *baitu*, avoiding sequences alien to Basque and suggesting an affiliation between the two languages.

Linguistic palaeontology

The lack of cognate forms of a particular word in related languages may suggest that the earlier and common stage of the languages in question had no such word and linguistic differentiation occurred before such a word was needed to represent the relevant idea or cultural entity. For example, few words for metals are common to the Indo-European family of languages. This kind of information means to the practitioner of **linguistic palaeontology** that words for these items were unknown in the proto-language, which, therefore, must have broken up during the period of pre-metal usage or Neolithic times. Conversely, the various cognates for names of trees such as 'beech' suggest that the word existed in the proto-speech and that the homeland of the speakers was located in a region where these trees grew.

The lack of specific words in the parent language for grains and vegetables but many words for animals, both domestic and wild, suggest a heavy reliance on meat. Words relating to the level of the family are abundant, but those indicating a higher social order or political structure are not evident. Information of this kind may be used to reconstruct the cultural ambience and the geographical location of the proto-speakers.

Pitfalls abound, however, in the study of linguistic palaeontology; besides the fact that words may change their reference (a *robin* in England is not the same species as a *robin* in the USA), they are also readily borrowed from language to language. The word *tobacco*, common to the Romance languages, could easily lead to the false conclusion that the Romans smoked. The word itself appears to have spread from Spanish and Portuguese to the other Romance languages at a much later time.

Genetic classification of language

A major result of historical and comparative linguistic investigation has been the mapping of the world's languages into groupings of related languages, called 'families', and sub-groupings within these families. When a given language has been shown to belong within the folds of a particular grouping as defined by linguistic relationships indicating a common descent from an earlier source language (a proto-language), it is said to have been classified genetically. (This use of 'genetic' has nothing to do with DNA or biological genetics but rather reflects the meaning of the Ancient Greek source for the word, i.e. 'having to do with origins'.) A useful method for

expressing genetic relationships is the family-tree diagram consisting of the parent (proto-)language as the starting point and branches indicating the descended 'offspring' languages (to extend the metaphor of a biological family tree).

Genetic classification has shown that the vast majority of the languages currently spoken in Europe belong to one of four families: Indo-European, Uralic, Caucasian and Basque. In addition, some 300 or more other language families have been recognised around the world. It may well be that some reduction of this number is possible, in that some families may form higher-order 'phyla' with other families, but such moves are often controversial and not warranted by the methods mentioned here (e.g., rigorous application of the comparative method, which depends on an assumption of relatedness if it is to work).

Indo-European

The Indo-European family extended from Europe to India and in recent times has spread over much of the globe, including North America, South Africa, Australia and New Zealand as well as a number of pockets around the world. It is the most thoroughly investigated and best-known family of languages today and is derived from a hypothetical parent called **Proto-Indo-European**, thought to have been spoken in the fifth millennium BC (see Figure 1). Judging from the distribution of the various Indo-European languages, their migratory chronologies, and from archaeological evidence (Kurgan culture), the parent language is thought to have originated in the region of the Black Sea, though much is controversial about this issue.

The major groupings of the Indo-European family of languages are shown below. The **Germanic** branch of Indo-European has been divided into three subgroups: East Germanic languages are now extinct but the best known is Gothic, for which written texts exist from the fourth century AD. The North Germanic or Scandinavian branch includes Icelandic, Norwegian, Swedish, Danish and Faroese. West Germanic contains German, Yiddish, Dutch, Flemish, Frisian, Afrikaans and English. Afrikaans is a descendant of Dutch spoken by the early white settlers of South Africa, the Boers. Frisian is spoken along the northern coast of the Netherlands, the north-western coast of Germany and on the Frisian Islands. English is derived from the languages of the Angles, Saxons and Jutes, Germanic tribes of northern Germany and southern Denmark who began settling in England in the fifth century AD.

The once-widespread **Celtic** languages, extending from the British Isles to the Anatolian peninsula, are now generally extinct except for those surviving in the British Isles and Brittany. The Continental Celtic languages are best known from Gaulish, spoken in France, and Hispano-Celtic (also known as Celtiberian), of Spain and Portugal, which have bequeathed some documentation. The insular branch has been segmented into two groups – Brythonic and Goidelic – of which the former includes Welsh and Breton, and the latter Irish Gaelic and Scots Gaelic. Breton is an offshoot of now-extinct Cornish, spoken in Cornwall up to the eighteenth century.

Prior to about the third century BC, linguistic relationships on the **Italic** peninsula are obscure, but clearly attested after this time as belonging to the Indo-European family are the two groups Sabellic (best represented by Oscan and Umbrian) and Latino-Faliscan. Latin, in time, displaced the other languages on the peninsula and gave rise to the Romance group of languages.

Indo-European speakers of what was to become the **Hellenic** or **Greek** branch entered the Balkan peninsula of south-eastern Europe apparently sometime early in the second millennium BC, and at a later time we can speak of two main groups: East Greek, called Attic-Ionic, the

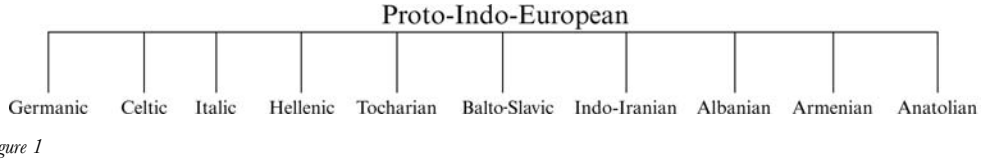


Figure 1

languages of Attica and much of Asia Minor, and West Greek. All modern Greek dialects except Tsakonian are descendants of the Hellenistic koiné, based largely on Attic, the speech of classical Athens.

Tocharian is a group of two Indo-European languages, forming their own subgroup, recovered from manuscripts of the seventh and eighth centuries AD. It was once spoken in what is now Chinese Turkestan.

The **Balto-Slavic** branch is composed of two main subgroups, Baltic and Slavic. Lithuanian, Latvian (or Lettish) and the now-extinct Old Prussian make up the **Baltic** languages, situated along the eastern coast of the Baltic Sea. Lithuanian contains an elaborate case system much like that established for the parent Indo-European language.

The **Slavic** branch is composed of three subbranches: East, South and West Slavic. East Slavic consists of Russian, Ukrainian and Byelorussian, the latter spoken in Belarus (capital Minsk) to the west of Russia, while South Slavic is composed of Bulgarian, Macedonian, Slovenian, and Bosnian, Croatian and Serbian (formerly called 'Serbo-Croatian' but now reflecting the various nation-states that emerged out of the former Yugoslavia). The West Slavic branch includes Czech, Slovak, Polish and Sorbian (Lusatian).

The **Indo-Iranian** branch was carried to India and Iran and consisted of two main branches: Indic and Iranian. The former appeared as Sanskrit, which subsequently evolved into the various Indo-European languages of India and Pakistan, such as Hindi, Urdu, Bengali and Gujarati, while the latter evolved early into the Avestan and Old Persian dialects. Various Iranian languages are in use today and include Pashto, Persian, Kurdish and Ossetic, among others.

Forming its own branch as well is **Albanian**, spoken since ancient times in the southern Balkans and now found in Albania and parts of Greece, Macedonia and southern Italy. Its putative relationship to the poorly known ancient Illyrian or Thracian languages is disputed and rests on slender evidence at best.

Located primarily in the Caucasus and northeastern Turkey, the **Armenian** language, attested from the fifth century AD, also continues its own line of descent as a separate branch of Indo-European.

Indo-European migrations into the **Anatolian** peninsula gave rise to Hittite and the related Luwian, Palaic, Lydian and Lycian languages. All are now extinct.

There are many other extinct languages such as Illyrian, Thracian, Ligurian, Sicil and Venetic, whose scanty documentation points to membership in the Indo-European family, but their affiliations are unclear.

Uralic

Consisting of about twenty languages, the Uralic family is spread out across the northern latitudes from Norway to Siberia. There are two major branches: Samoyedic and Finno-Ugric. The former is spoken in Russia and Siberia; the latter includes Hungarian, Finnish, Estonian and Lappish. They are primarily agglutinating languages [*see* LINGUISTIC TYPOLOGY] with an extensive system of cases. The proto-language may have been spoken in the northern Ural mountains about 6000 BC. The earliest texts are from the twelfth century AD, a Hungarian funeral oration.

Caucasian

The languages of the Caucasus area are often referred to as the 'Caucasian languages' but in fact this is a geographic designation; there are some thirty-five languages in the area, in three recognised language families: North-east Caucasian (including Abxaz and Kabardian), Northwest Caucasian (including Chechen-Ingush) and South Caucasian (better known as Kartvelian, including Georgian). The languages are characterised by glottalised consonants, complex consonant clusters and few vowels. The earliest texts are in Georgian, a Kartvelian language, and date back to the fifth century AD.

Languages of Asia

Language families indigenous to Asia are Altaic, Sino-Tibetan, Austro-Asiatic and Dravidian.

Though controversial, a wide-ranging language family has been posited for many of the languages of Turkey, Russia, China and Mongolia, and possibly also Korea and Japan. This

'**Altaic**' family comprises some thirty-five to forty-five languages, in three main branches: Turkic, Tungusic and Mongolian, though some specialists include Japanese and Korean in the family as well. The family is characterised by agglutinating structures and some languages by vowel harmony. The earliest Turkish texts, the Orkhon inscriptions, date from the eighth century AD.

Second only to Indo-European in number of speakers, the **Sino-Tibetan** family contains about 300 languages in two major branches: Tibeto-Burman and Sinitic (Chinese). The Sinitic branch encompasses northern and southern groups of languages. The principal language of the north is Mandarin, and those of the south are Cantonese and Wu. Tibeto-Burman languages are found in Tibet, India, Bangladesh and Burma. The region contains great linguistic diversity and, as yet, the overall linguistic picture is unclear. The languages are generally tonal [*see* TONE LANGUAGES].

The **Austro-Asiatic** family consists of about 150 languages, in two major groupings: Munda, which includes languages of central and north-east India; and the larger Mon-Khmer group with Cambodian (Khmer), Vietnamese and many others of Cambodia and Vietnam, Burma and southern China. These languages are characterised by complex vowel systems, and some (e.g., Vietnamese) by tones. The Mon-Khmer branch may have been a unified language in the second millennium AD. The earliest texts date to the sixth century AD.

Found mainly in southern India, there are about twenty-three **Dravidian** languages. The most important, in terms of number of speakers, are Telegu, Tamil, Kannada and Malayalam. Dravidian peoples appear to have been more widespread once, but were displaced southward during the Indo-European incursions into northern India. The languages are commonly agglutinating and non-tonal, with retroflex consonants and word-initial stress.

Languages of Africa

The number of distinct languages spoken throughout Africa is estimated at about 1,000, all of which belong to one of the four language families: Afro-Asiatic, Niger-Kordofanian, Nilo-Saharan and Khoisan.

Afro-Asiatic, often referred to by its older name of Hamitic-Semitic, is a group of languages spoken mainly across the northern half of the continent and throughout the Middle East, and consists of about 250 languages divided into six primary branches: Egyptian, now extinct except for the limited use of its descendant, Coptic, in religious rituals; Cushitic languages of Ethiopia, the Sudan, Somalia and Kenya; Berber, once widespread across the northern regions of the continent but now primarily restricted to pockets of speakers in Morocco and Algeria; Chadic, spoken in the region of Lake Chad and distinguished from the other groups through the use of tones; Omotic, considered by some to be a branch of Cushitic; and Semitic, the branch responsible in large part for the displacement of the Egyptian and Berber branches, spoken throughout the Middle East, across North Africa and in Malta. The three best-known members of this branch are Arabic, Hebrew and Amharic. Pharyngeal sounds and consonantal roots characterise many of the languages.

The **Niger-Kordofanian** language family covers much of the southern half of the African continent and embodies many more languages than Afro-Asiatic. Of the two main branches, Kordofanian and Niger-Congo, the latter consists of especially numerous sub-branches. The languages are typically tonal (except Swahili) and usually agglutinating in structure. Perhaps the best-known subgroup of Benue-Congo, itself a branch of Niger-Congo, is Bantu, which consists of over 100 languages, including Swahili, Zulu and Kikuyu. Found primarily in East and Central Africa, the **Nilo-Saharan** family contains several subgroups and about 120 languages. They are generally tonal and nouns are often inflected for case. This family is still relatively unexplored. Some of the languages are Masai (Kenya), Nubian (Sudan) and Kanuri (Nigeria).

Squeezed by Bantu expansion from the north and European expansion from the south, **Khoisan** speakers of approximately fifteen languages are now pretty well restricted to areas around the Kalahari Desert. This family, unlike any other, is characterised by clicks of various kinds which function as part of the consonantal system. A few neighbouring languages of the Bantu sub-branch, such as Zulu and Xhosa, have borrowed these clicks from the Khoisan

languages. They are also characterised by tones and nasal vowels.

Languages of the Pacific

Some 2,000 languages are (or were) spoken in the Pacific region (including the Indian Ocean and Australia), representing several language families and geographical groupings, about a quarter of the world's languages.

Austronesian, with c. 1,200 languages (perhaps the world's largest family, vying with Niger-Congo for that honour), extends from Madagascar to Easter Island and from Taiwan to New Zealand. Proto-Austronesian was spoken in Taiwan, where some ten indigenous Formosan Austronesian languages are/were found. The large Malayo-Polynesian branch (which used to be the name of the whole family) contains the languages outside of Taiwan, among which are the Philippine languages and the large Oceanic branch, whose members include among others Polynesian and Fijian languages.

The c. 750 **Papuan** languages include most of the non-Austronesian, non-Australian languages of the Pacific region, most in New Guinea (Papua New Guinea and Indonesia's Irian Jaya province), but some also in Alor, Bougainville, Halmahera, New Britain, New Ireland and Timor. Papuan languages do not represent a genetic grouping (language family), but opinion varies on their classification. For conservative classifiers, they fall into some eighty families; a commonly cited less conservative figure is sixty families; and even the most optimistic do not see being able to reduce the figure to less than twenty-five distinct families.

There are or were c. 200 distinct **Australian** languages – some cite 200–300 (all remaining ones highly endangered except c. twenty). They represent some twenty-five distinct language families. The large **Pama-Nyungan** family (c. 175 languages, in twenty-seven branches) covers 90 per cent of the country, with the several other families limited to far northern Australia.

Several questions of classification remain to be resolved, and there exist several controversial hypotheses of more distant, broader-scale groupings. For example, many believe all Australian languages are related, which is plausible, but it has not been possible to demonstrate this with standard linguistic methods. **Tasmanian** languages are also often thought to be distantly related to Australian languages, but this cannot be demonstrated, perhaps due to the long separation and poor quality of most of the surviving information on Tasmanian languages. The controversial Indo-Pacific hypothesis from Joseph Greenberg, however, has largely been abandoned. He argued that most of the non-Austronesian languages of the Pacific from the Andaman Islands to Tasmania, but excluding Australia, were genetically related. Most of these are Papuan. Specialists in these languages have rejected this hypothesis. Weak hypotheses of various sorts have attempted to link Austronesian with the likes of Ainu, Eskimo-Aleut, Indo-European, Sino-Tibetan, Japanese, Austro-Asiatic (including Munda and Mon-Khmer) and Austro-Tai (Austronesian with Tai-Kadai). None of these is accepted today.

American Indian languages

While many relationships remain unclear with regard to Amerindian languages in the northern hemisphere, the following families have been identified, to which most of the languages belong: **Eskimo-Aleut**, **Algonquian** (north-east USA and Canada), **Athapaskan** (Alaska, western Canada and south-western USA), **Salish** (Pacific north-west), **Wakashan** (Vancouver Island), **Siouan** (Great Plains), **Uto-Aztecan** (Mexico), **Muskogean** (south-eastern USA), **Iroquoian** (eastern USA), **Yuman** (Baja California), **Mayan** (Mexico and Guatemala). It is estimated that nearly 400 distinct languages were spoken in North America in pre-Columbian times, 300 of these north of Mexico. Today, about 200 survive north of Mexico, but many of these are near extinction.

Along with the languages of the Pacific, South American linguistic relationships are the least documented in the world, and estimates run from 1,000 to 2,000 languages, although only about 600 are actually recorded and 120 of these are extinct. Three major South American families which account for most of the known languages have been posited: **Andean-Equatorial**, whose principal language is Quechua; **Ge-Pano-Carib**, extending from the Lesser Antilles to

southern Argentina; and **Macro-Chibchan**, covering some of Central America, much of northern South America and parts of Brazil.

Some language isolates

In some cases, a single language has no known relationships with other languages and cannot be assigned to a family. When this occurs, the language in question is called an **isolate**. Some languages that have not been related to any other are Basque (spoken in north-eastern Spain and south-western France), Ainu (of northern Japan), Kootenay (British Columbia), Gilyak (Siberia), Tarascan (California) and Burushaski (spoken in Pakistan). There are also the extinct Sumerian, Iberian, Tartessian and many other languages known only from inscriptional material.

J. M. A., H. C. D. and B. D. J.

Note

1 This entry is based in part on the entry by James M. Anderson in Edition 1 and 2 of this Encyclopedia.

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History of grammar

The grammars that concern linguists today have developed on the basis of a long tradition of describing the structure of language which began, in the West at least, with the grammars written by classical Greek scholars, the Roman grammars largely derived from the Greek, the speculative work of the medievals, and the prescriptive approach of eighteenth-century grammarians (Dinneen 1967: 166; Allen and Widdowson 1975: 47). These early grammars also form the basis for many grammars in use in schools in both native- and foreign-language teaching. In particular, the adaptation of Greek grammar to Latin by Priscian (sixth century) has been influential.

Priscianus major and Priscianus minor

Priscian's work is divided into eighteen books. The first sixteen, which the medievals called

Priscianus major, deal with morphology, and the last two, *Priscianus minor*, deal with syntax. Here, Priscian defined eight **parts of speech** (see Dinneen 1967: 114–15):

1. The **noun** is a part of speech that assigns to each of its subjects, bodies, or things a common or proper quality.
2. The **verb** is a part of speech with tenses and moods, but without case [the noun is inflected for case], that signifies acting or being acted upon …
3. The **participles** are not explicitly defined, but it is stated that they should come in third place rightfully, since they share case with the noun and voice and tense with the verbs.
4. The **pronoun** is a part of speech that can substitute for the proper name of anyone and that indicates a definite person.
5. A **preposition** is an indeclinable part of speech that is put before others, either next to them or forming a composite with them. (This would include what we would distinguish as 'prepositions' and 'preflxes'.)
6. The **adverb** is an indeclinable part of speech whose meaning is added to the verb.
7. The **interjection** is not explicitly defined, but is distinguished from an adverb, with which the Greeks identified it, by reason of the *syntactic independence it shows and because of its emotive meaning.*
8. The **conjunction** is an indeclinable part of speech that links other parts of speech, in company with which it has significance, by clarifying their meaning or relations.

It is easy to see that a variety of bases for classification are in operation here: for instance, the noun is defined on the basis of what it refers to – a semantic type of classification – and also on formal grounds: it is conjugated for case. Similarly, the verb is formally defined as that class of item which is conjugated for tense and mood but also in terms of what it signifies. Considering the grammar as a whole, Dinneen (1967: 118–23) demonstrates that it was in fact an insufficient and often incorrect description even of Latin, largely because Priscian underemphasises formal features while overemphasising meaning in the process of classification.

Medieval and Renaissance grammars

Priscian's grammar exerted a powerful influence on grammarians of the medieval period. It was adjusted in the twelfth century by Peter Helias, a teacher at the University of Paris, to take account of changes which the Latin language had undergone since Priscian's time, and also to take account of the new interest in Aristotelian logic of the period (Dinneen 1967: 128). The only formal advance made in Helias's commentary was a development of Priscian's original distinction between **substantival nouns** and **adjectival nouns**, which became the now familiar distinction between nouns and adjectives (Dinneen 1967: 132).

In addition to the notion of parts of speech, the Greeks developed most of the grammatical concepts we are familiar with today, such as **gender**, **inflection**, **voice**, **case**, **number**, **tense** and **mood**, and the Romans retained them. Since Latin was of the utmost importance in the medieval period in Europe, as the language of diplomacy, scholarship and religion (Lyons 1968: 14), Latin grammar became a fundamental ingredient of the school system, and later grammars of the different vernacular languages were modelled on Latin grammars. The earliest non-Latin grammars include a seventh-century grammar of Irish, a twelfth-century grammar of Icelandic and a thirteenth-century grammar of Provençal – but it was during the Renaissance that interest in the vernacular became really widespread, and the writing of grammars of the vernacular truly common (Lyons 1968: 17). One of the most famous Renaissance grammars is the *Grammaire générale et raisonnée* published in 1660 by the scholars of Port Royal [*see* PORT-ROYAL GRAMMAR].

Early grammars of English

Grammars of English became common in the eighteenth century; the most famous of these being Bishop Robert Lowth's *A Short Introduction to English Grammar* (1762) and Lindlay Murray's *English Grammar* (1795). These early English grammars were written by scholars steeped in the Latin tradition, who felt that a grammar should provide a set of rules for correct language use, where 'correct' meant according to the rules

of the grammar of Latin. Such grammars are known as **prescriptive** or **normative**, and are often compared unfavourably with the **descriptive** grammars produced by linguists, whose main concern is with how a language *is* used, rather than with how some people think it *ought* to be used. Palmer (1971: 14–26) shows that many of the rules of prescriptive grammars, derived from Latin, are unsuitable to English, and that the reasons commonly given for observing the rules are unsound.

Take the rule which says that *It is I* is correct and that *It is me* is incorrect. The sentence consists of a subject *It*, a predicator *is*, which is a form of the verb *to be*, and a complement, *I/me*. In the case of Latin sentences containing the Latin verb *esse* ('be'), there is a rule according to which the complement must be in the same case as the subject. So if the subject is in the nominative, *ego* 'I', for example, or *tu* 'you', then the complement must also be in the nominative, and we get in a play by Plautus *Ego sum tu tu es ego* 'I am you, you are I/me'. The Latin case system and the rules for using it are then imposed on English: it is said that *I* is nominative, and *me* is accusative. But then, following the Latin rule, we clearly cannot allow *It is me*, since *it* is nominative and *me* accusative; therefore, *It is me* is ungrammatical. Palmer argues that this proof suffers from two defects, one being the virtual absence in modern English of a case system, and the other being the unjustifled assumption that Latin should be a model for English; had a case language other than Latin been chosen as a model (French, *C'est moi* 'It is me'), the rule for *be* might have been different; in other words, even among case languages the conventions governing the use of the various cases differ (as do the cases available in different languages), but English is not a case language anyway.

'Traditional grammar'

According to Palmer (1971: 26) the 'most notorious example' of a normative grammar within the last century is J.C. Nesfield's *Manual of English Grammar and Composition*, 'first published in 1898 and reprinted almost yearly after that and sold in huge quantities at home and abroad'. Palmer (1971: 41–106) draws on this grammar as he deals in detail with the terminology of so-called 'traditional grammar', showing, also, how these terms have been used in modern linguistics. The terminology refers to **grammatical units**, such as words, phrases, clauses and sentences on the one hand, and to **categories**, such as gender, number, person, tense, mood, voice and case on the other hand.

In traditional grammars, the **word** is rarely defined; it is simply assumed that everyone knows what a word is [*see* MORPHOLOGY]. The **sentence** is then defined as a combination of words, and the **parts of speech** as **classes** of words. As we have already seen above, the parts of speech can then be defined according to the kind of reference they have, and also according to how the words of the various classes take on various forms according to rules of **inflection**, and combine in various ways, according to the rules of **syntax**.

Most traditional grammars identify eight parts of speech, namely noun, pronoun, adjective, verb, preposition, conjunction, adverb and interjection. Nesfield defines the **noun** as (see Palmer 1971: 39) 'A word used for naming anything', where 'anything' may be a person, quality, action, feeling, collection, etc. The **pronoun** is a word used instead of a noun; an **adjective** qualifies a noun; a **verb** is a word used for saying something about something else (Palmer 1971: 59). The **preposition** is often said to be used to indicate directionality or place; and the **adverb**, to say something about the time, place and manner of that about which something is said by the verb. The **conjunction** links sentences or parts of them together, and the **interjection** is a word or group of words used as an exclamation.

The sentence, as well as being a combination of words, is also often defined by traditional grammarians as the expression of a complete thought, which it can only do if it contains both a subject and a predicate. In the most basic subject–predicate sentence, the **subject** is that which the sentence is about, and the **predicate** is what says something about the subject; an example would be *John laughed*, where *John* is subject and *laughed* is predicate. Dividing sentences into their parts like this is called **parsing** in traditional grammar. Subject and predicate need not, however, consist of single words, but may consist of several words (Palmer 1971: 80–1).

In Nesfield, for instance, we are instructed to divide a sentence first into subject and predicate, then to divide the subject into nominative and its enlargement and finally its predicate into finite verb, completion and extension, the completion being either object or complement or both. For the sentence, *The new master soon put the class into good order*, the analysis is shown in Table 1.

If what looks like a complete sentence appears as a part of something larger which also looks like a complete sentence, a traditional grammar will call the former a **clause**. Clauses are combined in two different ways to form sentences; they may either be **co-ordinated**, as when a number of clauses of equal standing or importance are joined together by *and* (*I wore a blue shirt and you wore a green dress*), or one clause may be **subordinate** to another, which is known as the **main clause**. Thus in *I wore a blue shirt while you wore a green dress*, *I wore a blue shirt* is the main clause to which the rest is subordinate. If the subordinate clause does not contain a **finite verb** – that is, a verb which gives a time reference, traditional grammars call it a **phrase**. In *I don't like you wearing that*, *you wearing that* is a phrase, not a clause, because *wearing* does not contain a time reference (as we can see if we try to change the time reference of the whole sentence from present to past, the change will occur in the main clause, *I didn't like*, while no change will occur in the phrase *you wearing that*).

Of the grammatical categories of traditional grammar, some are thought to be categories applicable to the noun, others to the verb, and the inflections which affect the forms of the words derive from the categories. The traditional categories and their definitions are (adapted from Palmer 1971: 834):

- *Gender* (**masculine**, **feminine** and **neuter**): a feature of nouns, associated with male, female and sexless things.
- *Number* (**singular** and **plural**): a feature of nouns and verbs, associated with one thing and more than one thing, respectively.
- *Person* (**first**, **second** and **third**): classifies the pronouns and is a feature of verbs.
- *Tense* (**present**, **past** and **future**): a feature of verbs, giving them a time reference.
- *Mood* (**indicative** and **subjunctive**): a feature of the verb associated with statements of fact versus possibility, supposition, etc.
- *Voice* (**active** and **passive**): a feature of the verb, indicating whether the subject is the doer of the action or the recipient of it.
- *Case* (**nominative**, **vocative**, **accusative**, **genitive**, **dative** and **ablative**): a feature of the noun, largely functionally definable (nominative for mentioning the subject, vocative for exclaiming or calling, accusative for mentioning the object, genitive for indicating ownership, dative for indicating benefit, ablative for indicating direction or agenthood; these definitions are not watertight and there are variations within languages) and translatable as *boy* (subject), *O boy*, *boy* (object), *of a boy*, *to* or *for a boy*, *from* or *by a boy*.

Other categories are applicable to languages other than English, and it is doubtful whether all of those listed are, in fact, applicable to English. They are, however, the ones often retained in traditional grammars. The definitions are not obviously helpful, as Palmer (1971: 84–97) convincingly demonstrates. For instance, in most languages grammatical gender has little connection with biological sex – in French, the moon,

Table 1

1. Subject		*2. Predicate*			
Nominative or Equivalent	Enlargement	Finite verb	Completion		Extension
			Object	Complement	
master	(1) The (2) new	put	the class	into good order	soon

which we must assume is sexless, is grammatically feminine (*la lune*) and, in German, a girl is grammatically neuter (*das Mädchen*). However, the terms for the categories recur in descriptive linguistics.

The grammatical categories restrict the forms of words through **concord** or **agreement** and through **government**. A verb has to agree with the noun which is its subject in person and number. In English this only affects the verb when the subject is the third person singular, except for the case of the verb *to be*. The concept of government is necessary in languages like Latin and German to account for the way in which certain prepositions and verbs determine the case of the noun. In English, however, the 'cases' are at most three – **genitive**, or **possessive**, which is indicated by *'s* or by the *of* construction (but where *of* does not alter the form of the noun following it); and, in the case of the pronouns only, **nominative** and **accusative**, *I/me*, *he/him*, *we/us*. These are not governed by verbs or prepositions, but by the grammatical function of the word in the clause, i.e. whether it is subject or object.

Case grammar

The notion of case has continued to play a role in grammar and was especially foregrounded by Fillmore (1966, 1968, 1969, 1971a, 1971b), who developed his **case grammar** in reaction to the neglect of the **functions** of linguistic items within transformational grammars as represented by, for instance, Chomsky (1965). These were unable to account for the functions of clause items as well as for their categories; they did not show, for instance, that expressions like *in the room*, *towards the moon*, *on the next day*, *in a careless way*, *with a sharp knife* and *by my brother*, which are of the category prepositional phrase, simultaneously indicate the functions, location, direction, time, manner, instrument and agent, respectively (Fillmore 1968: 21). Fillmore suggested that this problem would be solved if the underlying syntactic structure of prepositional phrases were analysed as a sequence of a noun phrase and an associated prepositional case-marker, both dominated by a case symbol indicating the thematic role of that prepositional phrase (Newmeyer 1986: 103).

Fillmore's argument is based on two assumptions: **the centrality of syntax** in the determination of case; and **the importance of covert categories**. In traditional grammar, **case** is morphologically identified; that is, cases are identified through the forms taken by nouns, and only then explained by reference to the functions of the nouns within larger constructions. However, some of the rules governing the uses of the case system cannot be explained very clearly in functional terms; the use of one case after certain prepositions, and another after certain other prepositions, seems a fairly arbitrary matter. In addition, not all languages mark case on the surface as clearly as, for example, Latin and German. In English, for instance, the singular noun only alters its form in the genitive with the addition of *'s*, and the personal pronouns alone have *I–me–my*, etc. (Palmer 1971: 15, 96–7).

However, in a grammar which takes syntax as central, a **case relationship** will be defined with respect to the framework of the organisation of the whole sentence from the start. Thus, the notion of case is intended to account for functional, semantic, deep-structure relations between the verb and the noun phrases associated with it, and not to account for surface-form changes in nouns. Indeed, there may not be any surface markers to indicate case, which is therefore a **covert category**, often only observable 'on the basis of selectional constraints and transformational possibilities' (Fillmore 1968: 3); they form 'a specific finite set'; and 'observations made about them will turn out to have considerable cross-linguistic validity' (Fillmore 1968: 5).

The term **case** is used to identify 'the underlying syntactic–semantic relationship', which is universal (Fillmore 1968: 24): 'the case notions comprise a set of universal, presumably innate concepts which identify certain types of judgements human beings are capable of making about the events that are going on around them, judgements about such matters as who did it, who it happened to, and what got changed.'

According to Fillmore (1968: 21), the notions of subject and predicate and of the division between them should be seen as surface phenomena only; a sentence consists of a proposition, a tenseless set of verb–case relationships, and a modality constituent consisting of such items as negation, tense, mood and aspect

(Newmeyer 1986: 105). Sentence (S) will therefore be rewritten as 'Modality (M) + Proposition (P)', and P will be rewritten as 'Proposition (P) + Verb (V) + one or more case categories' (Fillmore 1968: 24). The case categories, which Fillmore sees as belonging to a particular language but taken from a universal list of meaningful relationships in which items in clauses may stand to each other, are listed as follows (1968: 24–5):

- **Agentive** (**A**): the case of the typically animate perceived instigator of the action identified by the verb (***John*** *opened the door; The door was opened by* ***John***).
- **Instrumental** (**I**): the case of the inanimate force or object causally involved in the action or state identified by the verb (***The key*** *opened the door; John opened the door with* ***the key***; *John used* ***the key*** *to open the door*).
- **Dative** (**D**): the case of the animate being affected by the state or action identified by the verb (***John*** *believed that he would win; We persuaded* ***John*** *that he would win; It was apparent to* ***John*** *that he would win*).
- **Factitive** (**F**): the case of the object or being resulting from the action or state identified by the verb, or understood as a part of the meaning of the verb (Fillmore provides no example, but Platt 1971: 25 gives, for instance, *The man makes a* ***wurley***).
- **Locative** (**L**): the case which identifies the location or spatial orientation of the state or action identified by the verb (***Chicago*** *is windy; It is windy in* ***Chicago***).
- **Objective** (**O**): the semantically most neutral case, the case of anything representable by a noun whose role in the action or state identified by the verb is identified by the semantic interpretation of the verb itself; conceivably the concept should be limited to things which are affected by the action or state identified by the verb. The term is not to be confused with the notion of direct object, nor with the name of the surface case synonymous with accusative (*The* ***door*** *opened*).

The examples provided make plain the mismatch between surface relations such as subject and object, and the deep-structure cases.

Fillmore (1968: 26, 81) suggests that two further cases may need to be added to the list given above. One of these, **benefactive**, would be concerned with the perceived beneficiary of a state or an action, while dative need not imply benefit to anyone. The other, the **comitative**, would account for cases in which a preposition seems to have a comitative function similar to *and*, as in the following example, which Fillmore quotes from Jespersen (1924: 90): *He and his wife are coming / He is coming with his wife.*

Verbs are selected according to their case frames; that is, 'the case environment the sentence provides' (Fillmore 1968: 26). Thus (Fillmore 1988: 27):

> The verb *run*, for example, may be inserted into the frame [- A], … verbs like *remove* and *open* into [- O + A], verbs like *murder* and *terrorise* (that is, verbs requiring 'animate subject' and 'animate object') into [- D + A], verbs like *give* into [- O + D + A], and so on.

Nouns are marked for those features required by a particular case. Thus, any noun occurring in a phrase containing A and D must be [+animate].

The case frames will be abbreviated as **frame features** in the lexical entries for verbs. For *open*, for example, which can occur in the case frames [-O] (*The door opened*), [-O + A] (*John opened the door*), [-O + I] (*The wind opened the door*) and [-O + I + A] (*John opened the door with a chisel*), the frame feature will be represented as + [-O(I)(A)], where the parentheses indicate optional elements. In cases like that of the verb *kill*, where either an I or an A or both may be specified, linked parentheses are used (Fillmore 1968: 28): + [-D(I)(A)].

The frame features impose a classification of the verbs of a language. These are, however, also distinguished from each other by their transformational properties (Fillmore 1968: 28–9):

> The most important variables here include (*a*) the choice of a particular NP to become the surface subject, or the surface object, wherever these choices are not determined by a general rule; (*b*) the choice of prepositions to go with each case element, where these are determined by idiosyncratic properties of the verb rather than by a general rule; and (*c*) other special

> transformational features, such as, for verbs taking S complements, the choice of specific complementisers (*that*, *-ing*, *for*, *to*, and so forth) and the later transformational treatment of these elements.

Fillmore claims that the frame-feature and transformational-property information which is provided by a theory that takes case as a basic category of deep structure, guarantees a simplification of the lexical entries of transformational grammar.

With the list of cases go lists of roles fulfilled by the things referred to by the linguistic items in the various cases. One such list, organised hierarchically, is presented in Fillmore (1971a: 42):

(a) AGENT	(e) SOURCE
(b) EXPERIENCER	(f) GOAL
(c) INSTRUMENT	(g) LOCATION
(d) OBJECT	(h) TIME

The idea behind the hierarchy is that case information will allow predictions to be made about the surface structure of a sentence: if there is more than one noun phrase in a clause, then the one highest in the hierarchy will come first in the surface form of the clause, etc. This explains why *John opened the door* (AGENT, ACTION, OBJECT) is grammatical while *The door opened by John* (OBJECT, ACTION, AGENT) is not. Newmeyer (1986: 104–5) mentions this type of syntactic benefit as a second kind of benefit. Fillmore claims that case grammar gains from taking case to be a primitive notion. A third claim is made for semantic benefit. Fillmore points out that the claim made in transformational-generative grammar, that deep structure is an adequate base for semantic interpretation, is false. Chomsky (1965) would deal with *the door* as, respectively, deep-structure subject and deep-structure object in the two sentences:

> The door opened.
> John opened the door.

Case grammar makes it clear that, in both cases, *the door* stands in the same semantic relation to the verb, namely OBJECT: '*Open* is a verb which takes an obligatory OBJECT and an optional AGENT and/or INSTRUMENT' (Newmeyer 1986: 104, paraphrasing Fillmore 1969: 363–9).

As mentioned above, Fillmore (1968: 30–1) claims that entering the cases associated with verbs in the lexicon would lead to considerable simplification of it, since many pairs, such as *like* and *please*, differ only in their subject selection while sharing the same case frames, + [- O + E], in the case of *like* and *please*. However, transformationalists (Dougherty 1970; Chomsky 1972c; Mellema 1974) were quick, in their turn, to point to the problems involved in subject selection, the rules for which would seriously complicate the transformational component (see Newmeyer 1986: 105–6).

Fillmore (1977) lists a number of criticisms of case grammar, and his answers to them. A major worry is that no linguist has developed a grammar in which the notion of case figures has been able to arrive at a principled way of defining the cases, or of deciding how many cases there are, or of deciding when two cases have something in common as opposed to being simply variants of one case (Cruse 1973; compare the cases identified by Fillmore with those listed by Halliday, for example, for which *see* SYSTEMIC-FUNCTIONAL GRAMMAR). For example, Huddleston (1970) points out that in *The wind opened the door*, *the wind* may be interpreted as having its own energy and hence as being AGENT, or as being merely a direct cause of the door opening, and hence as INSTRUMENT, or as having a role which is distinct from both AGENT and INSTRUMENT, called, perhaps, 'force'. On yet another view, a case feature 'cause' can be seen as a feature of both agent and instrument (Fillmore 1977: 71). Fillmore thinks that this problem may be explained with reference to the notions of perspective and of meaning being relativised to scenes (see above). The wind is brought into perspective in the clause and is thus a **nuclear element**. And (Fillmore 1977: 79–80) 'perspectivising corresponds, in English, to determining the structuring of a clause in terms of the nuclear grammatical relations'.

The obvious attractions of case grammar include the clear semantic relevance of notions such as agency, causation, location, advantage to someone, etc. These are easily identifiable across languages, and are held by many psychologists to play an important part in child language

acquisition. In addition, case grammar was instrumental in drawing the attention of an initially sceptical tradition of linguistic study to the importance of relating semantic cases or thematic roles to syntactic descriptions.

Early grammars in America

As mentioned in the section above, Fillmore's **case grammar** was developed in reaction to early transformational-generative grammars. Prior to the appearance of these, most work on grammar published in the USA in the 1940s and 1950s was heavily influenced by Leonard Bloomfield's book, *Language* (1933/1935), which is characterised by a strict **empiricism**. Bloomfield believed that, if linguistics was to be scientific, it must confine itself to statements about observables, and grammars in this tradition are 'discovered' through the performing of certain operations, called **discovery procedures**, performed on a corpus of data. The data consist of speech, so the first operation the grammarian will need to perform is a phonological analysis of the stream of sound into phonemes [*see* PHONEMICS].

During the second stage of observation-based analysis, the phonemes will be grouped into types of structure. The smallest recurrent sequences of phonemes are called **morphs**, and those morphs which are phonemically similar and which are in **complementary distribution**, i.e. have no contexts in common, are members of the same **morphemes** [*see* MORPHOLOGY]. So when we look at language at this level, it consists of strings of morphemes. But morphemic information, since it can only be gained *after* phonemic information has been discovered, cannot be drawn on in the discovery of phonemic information, since then the account would be circular. This consideration gives rise to the principle that the levels of linguistic description must not be mixed and to a strict 'bottom-up' one-way ordering of linguistic descriptions.

Having discovered the morphemes of a language, the task of the linguist is to discover how the morphemes may be combined; that is, to write the grammar. According to Bloomfield (1933/1935: 184) words can occur as larger forms, arranged by **modulation**, **phonetic modification**, **selection** and **order**, and any such arrangement which is meaningful and recurrent is a **syntactic construction**. By **modulation**, Bloomfield means intonation and stress, and by **phonetic modification** he means the kind of phenomenon by which *do not* becomes *don't*, and *run* becomes *ran*. The problems with these concepts are discussed in Palmer (1971: 119–23; *see also* MORPHOLOGY). Here I shall only discuss the two really structural ways of making syntactic constructions – namely, selection and order.

Basically, what is at issue here is that in uttering a syntactic structure we select morphemes and place them in order. This ordering is clearly very important – it matters a great deal whether I say *Brutus killed Caesar* or *Caesar killed Brutus*. In Latin it would not matter, because the names would be inflected for case (see 'Traditional grammar' above). So it looks as if, in English, word ordering performs the same kind of function that the morphemes that are used to give the Latin case endings perform in Latin.

Selection of morphemes, and combinations of selections, is equally important, since when the same form is selected in combination with a variety of forms that differ from one another, the resultant forms are also different from one another. For instance, when a noun, *milk*, is combined with an adjective, *fresh*, the resultant combination, *fresh milk*, is different from the result of combining *milk* with the verb *drink*, *drink milk*. In the first case, we have a noun phrase; in the second, a sentence in the imperative mood. So by combining a selected morpheme or group of morphemes with other, different, morphemes the linguist is able to discover different **form classes** (Palmer 1971: 123): '*drink milk* is different from *fresh milk*, and as a result of this difference we can identify *drink* as a verb and *fresh* as an adjective'. Thus the principle of complementary distribution influences discovery procedures in syntactic analysis, too; albeit in a different way, as here morphemes are said to be of the same syntactic type if they are not in complementary distribution; that is, if they display **distributional equivalence** (i.e. if they occur in the same range of contexts). For instance, any morpheme that can occur before the plural {-s} morpheme is a noun (Newmeyer 1986: 9).

The notion of the form class was developed by Fries (1952/1957), who described English as having four major form classes defined according to the kinds of frames words of a class could enter into, as follows (from Allen and Widdowson 1975: 53–4):

- Class 1 words fit into such frames as:
  (The) ____ was good
  (The) ____ s were good
  (The) ____ remembered the ____
  (The) ____ went there
- Class 2 words fit the frames:
  (The) 1 ____ good
  (The) 1 ____ (the) 1
  (The) 1 ____ there
- Class 3 words fit the frames:
  (The) 1 is/was ____
  (The) ____ 1 is/was
- Class 4 words fit the frames:
  (The) 3 1 is/was ____
  (The) 1 2 (the) 1 ____
  (The) 1 2 there ____

The numerals in the examples refer to words of the respective classes.

Although the correspondence is not complete, it is clear that there is a large amount of overlap between Fries' classes and nouns, verbs, adjectives and adverbs, respectively; similarly, Fries recognised fifteen groups of **function words**, corresponding roughly to articles, auxiliaries, prepositions and so on. However, the perceived advantage of Fries' classification was its distributional character.

Because of the emphasis on classes, this kind of grammar is often labelled **taxonomic**.

There are very few actual descriptive syntactic studies available from the post-Bloomfeldians, largely because the processes of arriving at them are lengthy; and what there is has largely had to bypass its own prescribed procedures, since no complete morphemic analysis was ever worked out for English (or for any other language). Wells' (1947) 'top-down' immediate constituent analysis has, however, been widely applied (see the section on Immediate Constituent Analysis below).

Tagmemics

The term **tagmeme** was used by Bloomfield (1933/1935) to stand for the smallest unit of grammatical form which has meaning. A tagmeme could consist of one or more **taxemes**, 'the smallest unit [of grammar] which distinguishes meanings, but which has no meaning itself' (Dinneen 1967: 264). The notion of the tagmeme was developed largely by Kenneth Lee Pike (1967, 1982; but see also Longacre 1964, 1968–9/1970, 1976, 1983) into a full-blown grammatical theory, called tagmemics, although the assumptions on which the theory is based are such that language cannot be viewed as a self-contained system and that linguistics, therefore, cannot be self-contained either, but must draw on insights from psychology, sociology, anthropology, and so on (Jones 1980: 78).

Tagmemics is based on four major assumptions (Waterhouse 1974: 5):

1. Language is … a type of human behaviour.
2. As such, it must be looked at in the context of and in relation to human behaviour as a whole.
3. An adequate theory of language is applicable to other types of behaviour as well, and to combinations of verbal and non-verbal behaviour; thus, it is a unified theory.
4. Human behaviour is structured, not random.

And on four postulates which are universals claimed to hold for all human behaviour (Jones 1980: 79–80):

1. All purposive behaviour, including language, is divided into units.
2. Units occur in context.
3. Units are hierarchically arranged.
4. Any item may be viewed from different perspectives.

A **unit** may have various physical forms. It may be distinguished from other units by its distinctive features and by its relationships with other units in a class, sequence or system. The distinctive unit of any behaviour is called the **behavioreme**, and the verbal behavioreme is the sentence (Waterhouse 1974: 27).

The **context** in which a unit occurs often conditions its form, and any unit must be analysed in its context. So, in the grammar, sentences must be analysed in the context of the discourse in which they occur, because the

choice of a particular discourse type (narrative, scientific, etc.) affects the choice of the linguistic units of which the discourse is composed.

The notion of the **hierarchy** is a cornerstone of tagmemic theory. By hierarchy is meant a part–whole relationship in which smaller units occur as parts of larger ones. Language is viewed as having a trimodal structuring: phonology, grammar and reference. Reference includes pragmatics and much of speech-act theory, while semantics is found among the meaning features of phonology and grammar, and in various aspects of reference (Jones 1980: 89). The modes and their levels interlock because units at each level may either be composed of smaller units of the same level or units from another level; and they may enter larger units at the same level or units at another level. The structurally significant levels of the **grammatical hierarchy** include morpheme (root), morpheme cluster (stem), word, phrase, clause, sentence, paragraph, monologue discourse, dialogue exchange and dialogue conversation (Jones 1980: 80).

The **perspectives** from which items may be viewed are the static perspective, the dynamic perspective and the relational perspective. From a **static** point of view, an item is a discrete, individual item or **particle**. A **dynamic** point of view focuses on the dynamics of items: the ways in which they overlap, blend and merge with each other, forming **waves**. The **relational** perspective focuses on the relationships between units in a system. A total set of relationships and of units in these relationships is called a **field**. Language may be described from each of these perspectives, and descriptions adopting the different perspectives complement but do not replace each other (Jones 1980: 79–80; Pike 1982: 19–30).

Tagmemics is sometimes called **slot-and-filler grammar**. The unit of grammar is the **tagmeme**. The tagmeme is the correlation of a specific grammatical function with the class of items which performs that function (Waterhouse 1974: 5). In other words, a tagmeme occurs in a particular place, or **slot**, in a sentence, where it fulfils a **function**, such as subject, predicate, head, modifier, which items of its **class** (noun, noun phrase, verb, verb phrase, adjective) are capable of fulfilling. Both slot and class must be represented in a tagmeme, because they represent different types of information, neither of which can be derived from the other: it is not possible to know from the fact that *student* is a noun which function it fulfils in any one of its possible occurrences. Thus, *student* is modifier in *the student employees* (Jones 1980: 81), but subject in *The student went to bed early*. It is simultaneously noun in both cases. Instead of providing two independent statements about a sentence – one dividing the sentence into minimal classified units such as noun phrases and verb phrases, and the other assigning grammatical functions like subject and predicator to these units – tagmemics offers an analysis into a sequence of tagmemes, each of which simultaneously provides information about an item's function in a larger structure, and about its class, which can fulfil that function (Crystal 1981b: 213).

The view of the tagmeme as a correlation between class and function reflects Pike's objection to the extreme distributionalism of mainstream Bloomfeldians, which he refers to as an **etic**, or exterior, **view of language** (Waterhouse 1974: 6): 'The etic view has to do with universals, with typology, with observation from outside a system, as well as with the nature of initial field data, and with variant forms of an emic unit'. Such a view, he thinks, needs to be supplemented with an **emic** view, 'concerned with the contrastive, patterned system of a specific language or culture or universe of discourse, with the way a participant in a system sees that system, as well as with distinctions between contrastive units'.

The method of analysing data in terms of positions in stretches of text and the linguistic units which can be placed in these positions – a basic technique in code-breaking – is useful for describing hitherto unknown languages. This has been one of the main aims of the **Summer Institute of Linguistics**, which Pike founded and which trains translators and field linguists in tagmemics. Waterhouse (1974) contains a comprehensive survey of the languages to which tagmemic analysis has been applied (see also Pike 1970).

While Longacre continues to employ a two-feature tagmeme, Pike adopts a four-feature view of the tagmeme in his later writings. He adds to slot and class the features role and cohesion. Jones (1980: 81) symbolises the four features as a four-cell array:

slot	class
role	cohesion

Role may be, for example, actor, undergoer (patient), benefactee and scope, which includes inner locative, goal and some experiencer (cf. 'Case grammar' above). **Cohesion** here is grammatical cohesion, cases in which 'the form or occurrence of one grammatical unit is affected by another grammatical unit in the language' (Jones 1980: 81). It includes such agreement features as number agreement in English and gender agreement in many Romance languages.

Tagmemes are the constituents of **syntagmemes**, also known as **patterns** or **constructions**. Some tagmemes are obligatory and are marked +, while optional tagmemes are marked -. In the four-cell notation, the intransitive clause *the farmer walks* would have two tagmemes – the first representing *the farmer;* the second, *walks* (Jones 1980: 82):

Intransitive Clause			
= +	Subject	Noun Phrase	
	Actor	Subject number >	
+	Predicate	Verb	
	Statement	> Subject number	
		> Intransitive >	

The arrow-like symbols in the cohesion cells above indicate cohesion rules such as (Jones 1980: 83):

> *Subject number:* the number of the subject governs the number of the predicate.
> *Intransitive:* mutual requirement of subject (as actor) and predicate tagmeme.

If the arrow is to the right, the tagmeme is the governing source; if the arrow is to the left, the tagmeme is the governed target.

The analysis can be summarised in a string such as IndeDecITClRt = + S:NP + ITPred: ITVP, which can be read as 'Independent Declarative Intransitive Clause Root consisting of obligatory subject slot filled by a noun phrase, followed by an intransitive predicate slot filled by an obligatory intransitive verb phrase' (cf. Waterhouse 1974: 11; Pike 1982: 82). There are a limited number of construction types at each of the grammatical **ranks** of sentence, clause, phrase, word and morpheme (Allen and Widdowson 1975: 57), and in this respect tagmemics bears a close resemblance to scale and category grammar [*see* SYSTEMIC-FUNCTIONAL GRAMMAR].

Tagmemes are the essential units of tagmemic analysis. But just as phonemes can be analysed into smaller units, which are classifiable as allophones of the phonemes, tagmemes can be analysed into smaller, etic, units called **tagmas**, which are **allotagmas** of the tagmeme (Crystal 1985: 304).

The ultimate aim of tagmemics is to provide a theory which integrates lexical, grammatical and phonological information. This information is presented in terms of **matrices**, networks of intersecting dimensions of contrastive features (Waterhouse 1974: 40). However, the view of language as part of human behaviour necessitates a recognition that language cannot be strictly formalised. No representational system could accommodate all the relevant facts of language, and tagmemics seeks a balance between the need for generalisations about language, and the particularities and variations found in it. Therefore, tagmemics accepts various different modes of representation for different purposes, and does not insist that there must be only one correct grammar or linguistic theory (Jones 1980: 78–9).

Tagmemics differed from most of the grammars of the period during which it was developed in looking beyond the sentence to the total structure of a text, and Longacre's work in this area is particularly well known. Longacre (1983: 3–6) claims that all monologue discourse can be classified according to four parameters: contingent temporal succession, agent orientation, projection and tension.

- **Contingent temporal succession** refers to a framework of temporal succession in which some, usually most, of the events in the discourse are contingent on previous events.
- **Agent orientation** refers to orientation towards agents with at least a partial identity of agent reference through the discourse.
- **Projection** refers to a situation or action which is contemplated, enjoined or anticipated, but not realised.

- **Tension** refers to the reflection in a discourse of a struggle or polarisation of some sort. Most discourse types can realise tension, so this parameter is not used to distinguish types of discourse from each other.

The parameters of contingent temporal succession and agent orientation provide a four-way classification of discourse types, with projection providing a two-way sub-classification within each, as shown in the matrix in Figure 1 (from Longacre 1983: 4).

Narrative discourse tells a type of story which involves contingent temporal succession and agent orientation. But the story may present its event as having already taken place, as in story and history, or as projected, as in prophecy.

Procedural discourse, which is about how to do or make something, also has contingent temporal succession, but it does not have agent orientation because it focuses on the actions involved in doing something rather than on the doer of the actions. Again, the projection parameter distinguishes two types of procedural discourse: after-the-fact accounts of how something was done and before-the-fact accounts of how to do something.

Behavioural discourse, which deals with appropriate behaviour, has agent orientation, but does not have contingent temporal succession. There are two types: one which deals with behaviour which has already taken place, as in eulogy; and one which prescribes/proscribes future behaviour as in hortatory discourse and a campaign speech – making promises about future actions.

Expository discourse, which expounds a subject, has neither agent orientation nor contingent temporal succession. It may, however, concern something which already pertains, as in the case of a scientific paper, or it may deal with something projected, as in the case of a futuristic essay.

Each type of discourse may be embedded within examples of the other types, and each type contains **main line** material, in which the main line of development takes place, and **supportive** material, which includes everything else.

The characteristic types of linkage of units displayed by each type of discourse are reflections of their classification on the contingent temporal succession parameter. Thus narrative and procedural discourse are characterised by **chronological linkage** (*and then*, *after that*, etc.), while behavioural and expository discourse have logical linkage (*if–then*, *because*, etc.). The presence or absence in different text types of lines of **participant reference** reflect their classification on the agent orientation parameter. Lines of participant reference are present in narrative and behavioural discourse, but absent in procedural and expository discourse. The projection

	+ Ag-orientation	– Ag-orientation	
+ Contingent temporal succession	Narrative	Procedural	
	Prophecy	How-to-do-it	+ Proj
	Story	How-it-was-done	– Proj
– Contingent temporal succession	Behavioural	Expository	
	Hortatory Promissory	Budget proposal Futuristic essay	+ Proj
	Eulogy	Scientific paper	– Proj

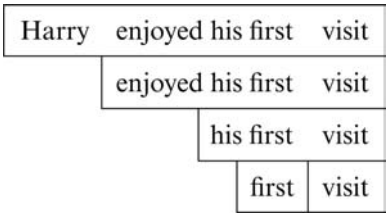
Figure 1

parameter is reflected in tense, aspect and voice characteristics (Longacre 1983: 6–7). For example, past tense characterises the main line of narrative discourse; present or future tense characterise the main line of procedural discourse (Longacre 1983: 14). Longacre also claims that different types of monologue discourse display characteristic initiating, closing and nuclear tagmemes and that each tends towards a particular paragraph and sentence type (see Waterhouse, 1974: 45–8; and *see* TEXT LINGUISTICS), but the most widely known aspect of his work on discourse is probably his view that narrative is structured in terms of Peak, Pre-peak and Post-peak episodes.

Peak may be marked by: change in tense and/or aspect; sudden absence of particles which have marked the event line of the story; disturbance of routine participant reference; **rhetorical underlining**, such as parallelism, paraphrase and tautologies [*see* STYLISTICS]; concentration of participants (stage crowding); and a number of other stylistic effects (see Longacre 1983).

Immediate constituent analysis

While most work on grammar in the Bloomfeldian tradition is based on a 'bottom-up' approach to grammatical analysis – beginning with the smallest linguistic unit and showing how smaller units combine to form larger ones – **immediate constituent analysis** (henceforth **IC analysis**) begins with a sentence – say, *Poor John ran away* (Bloomfield 1933/1935: 161) – the immediate constituents of which are *poor John* and *ran away*, and works gradually down through its constituent parts until the smallest units that the grammar deals with, which will be the **ultimate constituents** of a sentence, are reached; it is a 'top-down' approach. Both approaches are solely concerned with the surface structures of language; that is, they deal only with the language that is physically manifest, whether written or spoken, and make no mention of underlying structures or categories of any kind. The constituents may be represented hierarchically in rectangular boxes (Allen and Widdowson 1975: 55):



or on a Chinese box arrangement (Figure 2; Francis 1958; Allen and Widdowson 1975: 56), or lines between the constituents may be used (see Palmer 1971: 124).

A ||| young |||| man || with ||| a |||| paper | follow-||| ed || the |||| girl ||| with |||| a ||||| blue |||||| dress.

Alternatively, parentheses can be used, either (as in Palmer 1971: 125), within the sentence:

(((A) ((young) (man))) ((with) ((a) (paper)))) (((follow) (ed)) (((the) (girl)) ((with) ((a) ((blue) (dress)))))))

or drawn below the sentence (Nida 1968; Allen and Widdowson 1975: 55–6). According to Palmer (1971: 125), however, the best way to show IC structure is to use a **tree diagram** similar to the sort also employed by generative grammarians and transformational-generative grammarians [*see* FORMAL GRAMMAR; GENERATIVE GRAMMAR].

The main theoretical issue involved in IC analysis is, of course, the justification of the

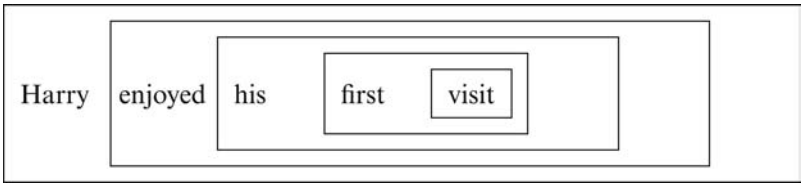
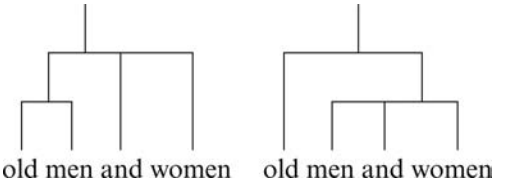


Figure 2

division of a sentence into one set of constituents rather than another set. Why, for instance, do we class *a young man* and *with a paper* as constituents rather than *a young*, *man with a* and *paper?* The answer given by Bloomfield (1933/1935), Harris (1951) and other proponents of IC analysis was that the elements which are given constituent status are those which may be replaced in their environment by others of the same pattern *or* by a shorter sequence of morphemes. The technical term used for this substitution test is **expansion**.

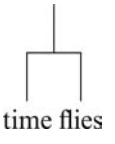
Thus, in Palmer's sentence above, it is clear that *a young man with a paper* can be replaced by a single morpheme, like *he*, for example, while *a young man with a paper followed*, in contrast, would fail the substitution test. *He* here would obviously not be a suitable substitute for that part of the item constituted by *followed;* it would, however, be suitable as a substitute for any item of the kind that we might call a **noun phrase**, of whatever length; that is, for any item conforming to a specific pattern. Similarly, *followed the girl with a blue dress* can be replaced by a two-morpheme item like *sleeps*. A full analysis into ICs would give the tree shown in Figure 3 (Palmer 1971: 125).

Cutting sentences into their constituents can show up and distinguish ambiguities, as in the case of (Palmer 1971: 127) the ambiguous item *old men and women*, which may either refer to 'old men' and 'women of any age' or to 'old men' and 'old women'. The two different interpretations can be represented by two different tree structures:



The type of expansion where the short item which can substitute for the longer item in the sentence is not actually part of that sentence item is called **exocentric expansion**. Another type, called **endocentric**, is more easily understood literally as expansion, since it works by the addition of more and more items to a head word in a group; for instance, *old men* above is an expansion of *men*, and further expansions would be *happy old men*, *the happy old men*, *the three happy old men*, *the three happy old men in the corner*, etc.

As the head word here, *men* is an item of the type normally classed as a noun, it would be reasonable to call it, and any expansion of it, a **noun group**, **noun phrase** or **nominal group**, and labelling items in grammatical terms clearly adds an extra, highly informative dimension to the division of sentences into constituents. Mere division into constituents of the ambiguous item *time flies* will neither show nor account for the ambiguity:



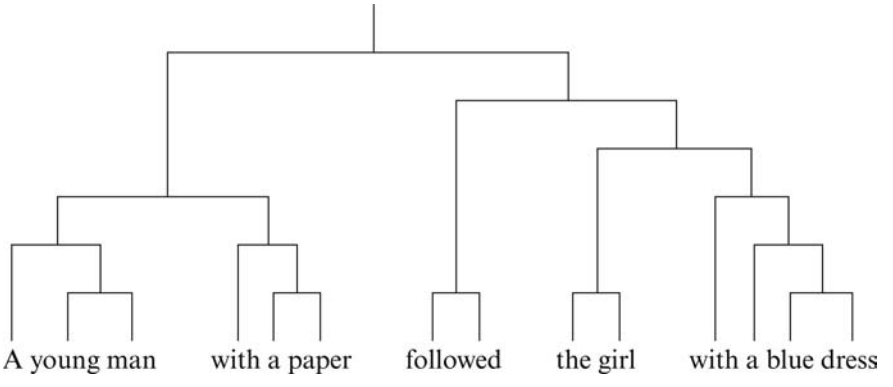


Figure 3

A labelled analysis, in contrast, would show that in one sense *time* is a noun and *flies* is a verb, while in the other sense *time* is a verb and *flies* a noun. The second sense allows for the joke (Palmer 1971: 132):

A: Time flies.
B: I can't; they fly too fast.

Labelled IC analysis is now commonly referred to as **phrase-structure grammar** – **scale and category grammar**, **tagmemics** and **stratificational grammar** are famous examples which go far beyond simple tree diagrams representing only sequential surface structure.

Pure IC, being developed by Bloomfield and his followers in the climate which then prevailed of strict empiricism, was meant to precede classification, but (Palmer 1971: 128):

> [i]n actual fact a great deal of IC cutting can be seen to be dependent upon prior assumptions about the grammatical status of the elements. … For instance, even when we start with a sentence such as *John worked* as the model for the analysis of *All the little children ran up the hill* we are assuming that both can be analysed in terms of the traditional categories of subject and predicate. This is implicit in the treatment of *All the little children* as an expansion of *John* and *ran up the hill* as an expansion of *worked*.

Of course, this fact does not prevent the notion of the immediate constituent from remaining very useful, and consequently drawn on frequently by contemporary grammarians; and IC, as conceived by Bloomfield (1933/1935), in spite of its shortcomings (see Palmer 1971), presented a great advantage over the haphazard 'methodology' of traditional grammatical classification and parsing.

K. M.

Suggestions for further reading

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1

Idioms

Idioms are a class of multi-word units 'which pose a challenge to our understanding of grammar and lexis that has not yet been fully met' (Fellbaum et al. 2006: 349). They are commonly believed to be qualitatively different from 'normal' language, but the precise nature of this difference can be elusive. Even amongst idiom scholars, it is difficult to find a consensus as to what precisely is, or is not, an idiom, because of the heterogeneity of the class.

There is widespread agreement on one general principle: an idiom is an institutionalised expression whose overall meaning does not correspond to the combined meanings of its component parts. However, this criterion can be said to apply to a wide range of **phraseological structures**, such as **collocations**, **formulaic greetings**, **clichés** and other **conventionalised expressions** which, although idiomatic to some extent, are not idioms in the strict sense. The challenge for idiom researchers is therefore to formulate a definition which is flexible enough to include all known idioms, yet exclude non-idioms such as those mentioned above.

An idiom is composed of two or more constituent parts, generally deemed to be words, although Hockett (1958: 177) admitted phonemes as constituents and Makkai (1972: 58) morphemes. Despite appearances to the contrary, each of these words does not contribute to the overall meaning of the phrase, which operates as if it were a lexical item in its own right and expresses a semantically complete idea which may be quite independent of the meanings of its components. The reasons for this semantic anomaly derive mainly from the fact that an idiom is not built up word by word, according to the grammar of the language, but is a **non-compositional phrase** which is learned, stored and recycled as a single chunk.

Current psycholinguistic views support the argument in favour of considering idiom as a type of 'long word' whose meaning is accessed directly and not through prior **decomposition** or **analysis** of the constituents (Gibbs 1994, 2002). However, when an idiom is encountered for the very first time, language-users have no choice but to decipher its meaning from the meaning of the constituents, usually doing so by taking into account the most salient meanings first (Giora 1997, 2002; Peleg and Giora 2001). That this tactic enjoys a limited success rate is due to the difficulty in identifying which meaning of polysemous components is relevant and the extent to which the idiom is semantically motivated or transparent.

The ease with which an idiom can be interpreted is based on its level of semantic transparency as well as truth conditions and other contextual cues. A **transparent** idiom yields its meaning easily, because there is a straightforward connection between the phrase and the intended meaning. For example, *not see the wood for the trees* ('to lose oneself in details and fail to see the larger picture') requires little semantic re-elaboration; it is therefore located towards the transparent end of the scale. On the other hand, an expression which has a more arbitrary relationship with its meaning, such as *to go cold turkey* ('suddenly stop taking a drug that you have become addicted to'), can be described as **unmotivated** or **opaque**. The transparency or

opacity of an idiom cannot be measured in absolute terms, as it is affected by the individual's real-world knowledge, awareness of cultural norms, and general familiarity with the phrase.

The more closely the wording of an idiom reflects a real-world situation, the easier it is to interpret: *make one's blood boil* reflects the heat felt in the body when enraged; *to bite the hand that feeds you* can easily be connected to ingratitude. In much the same way, an idiom which refers to a culturally familiar situation poses little difficulty to interpretation: knowledge of team sports reveals the principles of equality and inequality respectively encoded in *a level playing field* and *move the goalposts*. It is also true that an idiom which is familiar to the hearer is perceived as being more transparent than one which is not so familiar, regardless of its real-world or cultural relevance: *like a red rag to a bull* ('a provocation') is much less frequent than *make sb see red* ('provoke or anger sb') (Philip 2000), and therefore requires more effort in decoding. Finally, it is worth noting that, as with all figurative language, even transparent idioms pose problems for language learners who, lacking the necessary linguistic and cultural knowledge to decipher them, are apt to interpret them literally.

While some idioms dovetail into our conceptual system, not all do, and one well-documented feature of idioms is their adherence to, or violation of **truth conditions**. When a phrase alludes to events or situations that cannot possibly occur in the real world, a literal interpretation is incongruous: human blood is always red (*blue blooded*), kitchen implements do not speak to each other (*the pot calling the kettle black*), and animals do not fall from the sky as precipitation (*rain cats and dogs*). In situations such as these, the only way to make sense of the meaning is to treat the expression as idiomatic. Not all idioms violate truth conditions, and many phrases can, at least theoretically, be read literally or figuratively depending on which interpretation best fits the context in which the phrase appears.

A great deal of psycholinguistic literature deals with the effects of context on the interpretation of phraseological homophones – idioms which can have both literal and idiomatic readings. Here context is textual, not pragmatic, and is characterised by **biasing contexts** designed to sway the reader's interpretation towards an idiomatic or a literal meaning (for an example of this, see Giora and Fein 1999: 1605). Outside experimental conditions, contextual cues are particularly important in determining the meaning of idioms whose literal and figurative meanings are either not well established or occur with relatively low frequency: the phrase *cherry picking* may be used literally or figuratively, but its location in a text on blue-chip business would be incongruous if read literally, thus triggering its idiomatic reading ('being selective').

Recent corpus-based research into homonyms suggests that context is less crucial than previously believed, and that one of the possible readings usually predominates. According to Hoey (2005: 82ff.), it can be argued that language users will avoid using a familiar idiom in a context where it could be interpreted literally, preferring instead to paraphrase or use an alternative expression. Thus, under normal communicative conditions, a person who is literally skating on ice which is thin would not be described as *skating on thin ice;* and if a person who hits a bucket with their foot is described as having *kicked the bucket*, humour automatically ensues because of the clear mismatch between the more familiar, idiomatic meaning and the literal description of events.

Idioms are learned and reused as single lexical items, yet they are not single words. While the **canonical form** of an idiom (the citation form used for dictionary definitions) is fixed for the purposes of language description, the reality of language in use is that most idioms can undergo a controlled amount of variation to their typical realisation. There is some divergence in opinion on this point between theoretical and descriptive studies on idioms. Pre-corpus scholars defined idioms as being **fixed** or **frozen** in form, in reference to the fact that they resist morpho-syntactic change; now it is more common to find them described as **stable** (Čermák 1988) or of **limited flexibility** (Barkema 1996: 128). This difference in terminology is due to the fact that much pre-corpus literature on idioms deals only with what is theoretically possible, with the result that the categories and principles devised, while extremely detailed and rigorous, fail to reflect adequately the attested behaviour of idioms in use. Successive studies informed by corpus data,

notably Moon (1998), have challenged the notion of fixity in light of the observation that most idioms do in fact allow variation to occur, so long as some vestige of the canonical form survives.

Demonstrating the syntactic and semantic stability of idioms has been one of the prime considerations of figurative language scholars, especially those working within the generativist tradition. Idioms are said to be **transformationally deficient**, and in order to prove the case that non-canonical realisations of idioms cause their meaning to revert to literal, they can be subjected to a series of tests. The tests adopted fall into two broad categories: lexical and grammatical. The lexical tests include the augmentation test (addition of lexical constituents), the elimination test (deletion of constituents), the substitution test (replacing a constituent by a semantically related word), the permutation test (rearranging constituents whose order is fixed). The grammatical tests include blocking of predication, blocking of the formation of comparative and superlative forms of adjectives, blocking of nominalisation and blocking of passivisation (Gläser 1988: 268–9). As Gläser explains, '[a]s soon as these practical procedures are followed, the resulting construction will be grammatically correct and empirically sensible, but it will cease to be an idiom' (1988: 268).

Transformation tests do not stand up well to empirical scrutiny. Even before the widespread use of computer corpora, criticisms were levelled against this method of idiom classification, because it fails to look beyond the tested phrase and compare its behaviour to similar structures or semantically related language items. Chafe (1968: 122) argues that the blocking of passivisation can be explained by the underlying meaning of an idiom, not its idiomaticity. Citing *kick the bucket*, he points out that the literal equivalent *die* would similarly fail the passivisation test (**to be died*). The other transformation tests do little better, and are of limited relevance to those idioms which have no literal homonym (*hue and cry*, *in fine fettle*, *run amok*).

The availability of large, electronically searchable linguistic corpora has allowed idiom scholars to put transformations and other theoretical considerations to the test. Corpus-based studies illustrate that lexical variation in idioms is a widespread phenomenon, not one restricted to the creation of special linguistic effects such as punning, humour and irony. In Moon's (1998) study of fixed expressions and idioms in an 18-million-word corpus, attested lexical and morpho-syntactic variation is described in detail (1998: 75–174). Moon reports that approximately 40 per cent of the idioms and other fixed phrases studied occurred in a variant form (1998: 120). However, the larger the corpus is, the more variation occurs; in some cases the canonical form can be outnumbered by its variants (Philip 2008: 103).

Even if idioms are not fixed, they do have a stable form which is learned as a multi-word lexical item. This canonical form is subject to exploitation in the normal course of language use, and so idioms can appear with lexical and grammatical alterations, in truncated and augmented forms, and in phrases which merely allude to the original: 'Talk about Mr Pot and Mr Kettle?' (*the pot calling the kettle black;* Philip 2008: 103). The rules governing such exploitations have yet to be determined, but are believed to be predominantly conceptual and semantic in nature.

It has been established that figurative expressions are not merely colourful add-ons to the lexicon, but that they contribute to its **evaluative inventory** (Carter 1997: 159). Simply put, idioms have a literal counterpart in the language, but this counterpart is not a true synonym because it fails to express the evaluative meaning encoded in the idiom. Čermák (2001: 13) notes that 'idioms are a primary means for the expression of positive and negative attitudes', but goes on to lament the fact that little research has been carried out into the matter.

Idioms resist pigeon-hole definitions because they constitute a heterogeneous class of anomalous lexical items. In order to understand them fully, it is necessary to understand better the mechanisms at work in 'normal' language, and here, too, corpus analysis is challenging traditional descriptions. Idioms are less fixed than used to be believed, 'normal' language less free.

G. P.

Suggestions for further reading

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The International Phonetic Alphabet

The International Phonetic Alphabet is a means of symbolising the segments and certain non-segmental features of any language or accent, using a set of symbols and diacritics drawn up by the **International Phonetic Association (IPA)**. It is one of a large number of phonetic alphabets that have been devised in Western Europe over the centuries, but in terms of influence and prestige it is now the most highly regarded of them all. Hundreds of published works have employed it. It is used throughout the world by a variety of professionals concerned with different aspects of speech, including phoneticians, linguists, dialectologists, philologists, speech scientists, speech and language therapists, teachers of the deaf, language teachers, and devisers of orthographic systems.

Its origins lie in the alphabet (or rather alphabets) used by the forerunner of the IPA, the Phonetic Teachers' Association, founded in 1886 by Paul Passy (1859–1940), a teacher of modern languages in Paris. Since then, a number of slightly differing versions of the alphabet have been published at irregular intervals by the IPA. The latest was published in November 2005. Four versions of the alphabet can be found in publications since 1951: 'revised to 1951', 'revised to 1989', 'revised to 1993, updated to 1996' and 'revised to 2005'. All are available in near-A4-size chart form (see the reproductions in Figures 1–4).

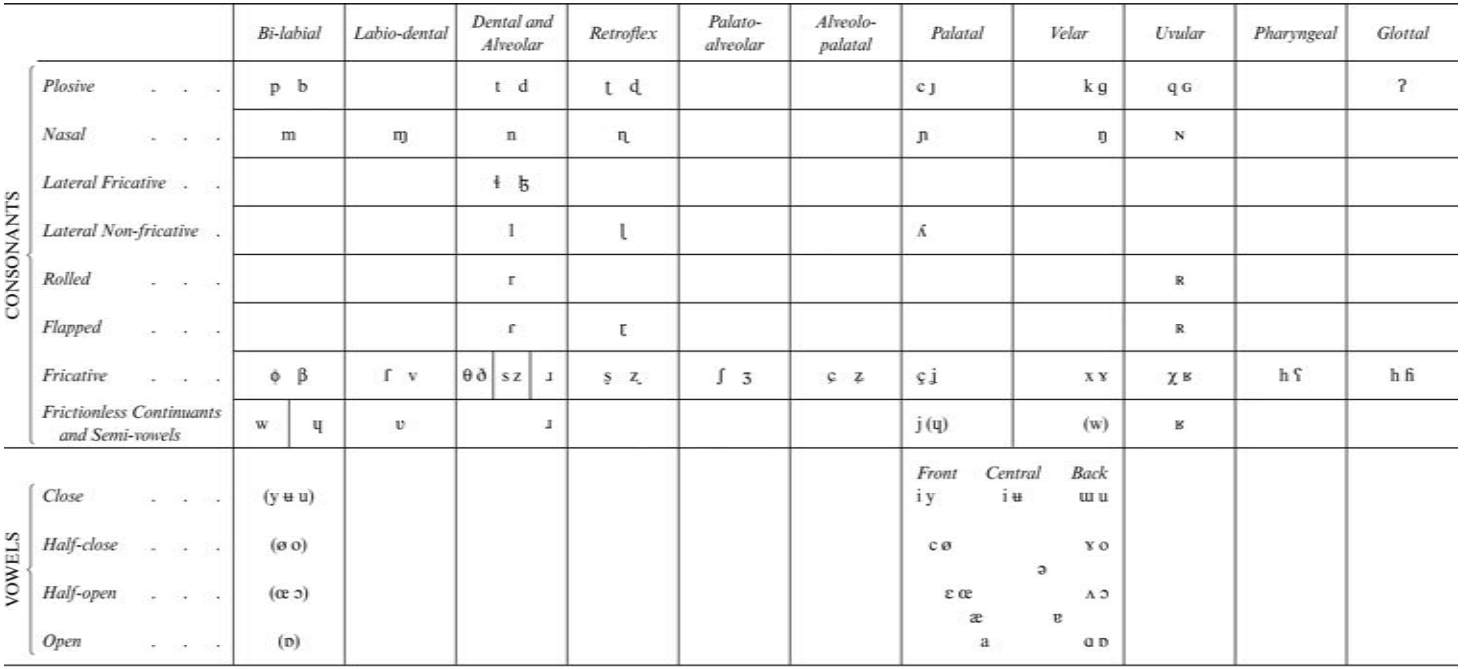
The 2005 chart is freely downloadable from http://www.langsci.ucl.ac.uk/ipa/ipachart.html

Braille versions of the alphabet have been proposed at various times, but there is as yet no standard one. An additional alphabet, ExtIPA (Extensions to the IPA), for the symbolisation of forms of disordered speech was formally adopted by the Association in 1994.

Detailed guidance on the manner in which the alphabet is used can be found in another of the Association's publications, the *Handbook of the International Phonetic Association: A Guide to the Use of the International Phonetic Alphabet* (1999). This is a large-scale revision of *The Principles of the International Phonetic Association* (1949). The guiding principles for the symbolisation of sounds have remained essentially, though not entirely, the same as those that the Association drew up and publicised as early as August 1888.

The aim of the notation is to provide the means for making a phonemic transcription of speech, or, in the original words of the Association, 'there should be a separate letter for each distinctive sound; that is, for each sound which being used instead of another, in the same language, can change the meaning of a word' (Phonetic Teachers' Association 1888). Thus, the distinction between English *thin* and *sin* can be indicated by the use of θ and s for the first segment in each word. It is often the case, however, that by the use of symbols, with or without diacritics, an allophonic as well as a phonemic [*see* PHONEMICS] notation can be produced. So, for example, the labiodental nasal in some English pronunciations of the /m/ in *symphony* can be symbolised allophonically as [ɱ] since the symbol exists to notate the phonemic difference between that sound and [m] in a language like Teke, a language of Central Africa. Nevertheless, the phonemic principle has sometimes been set aside in order to allow the notation of discernible allophonic differences within a single phoneme. Thus, far greater use is made in practice of the ɱ symbol for notating the labiodental nasal allophone of /m/ or /n/ in languages like English, Italian, and Spanish than for showing the phonemic contrast between /m/ and /ɱ/.

It is sometimes assumed that, since the alphabet is designated as *phonetic*, it should have the capacity to symbolise *any* human speech sound. This is not, nor has it ever been, the purpose of the alphabet. Its prime purpose is to handle the notation of *phonemes* in anyone of the world's 3,000 or more languages. If such symbols (with or without diacritics) can also be used for an allophonic transcription (of whatever degree of phonetic narrowness), then this must be seen as a sort of bonus.



		Bi-labial	Labio-dental	Dental and Alveolar	Retroflex	Palato-alveolar	Alveolo-palatal	Palatal	Velar	Uvular	Pharyngeal	Glottal
CONSONANTS	Plosive	p b		t d	ʈ ɖ			c ɟ	k g	q ɢ		ʔ
	Nasal	m	ɱ	n	ɳ			ɲ	ŋ	ɴ		
	Lateral Fricative			ɬ ɮ								
	Lateral Non-fricative			l	ɭ			ʎ				
	Rolled			r						ʀ		
	Flapped			ɾ	ɽ					ʀ		
	Fricative	ɸ β	f v	θ ð | s z	ʂ ʐ	ʃ ʒ	ɕ ʑ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
	Frictionless Continuants and Semi-vowels	w ɥ	ʋ	ɹ				j (ɥ)	(w)	ʁ		

		Front	Central	Back
VOWELS	Close	i y	ɨ ʉ	ɯ u
	Half-close	e ø		ɤ o
			ə	
	Half-open	ɛ œ		ʌ ɔ
		æ	ɐ	
	Open	a		ɑ ɒ

(Secondary articulations are shown by symbols in brackets)

OTHER SOUNDS.—Palatalized consonants: t̠, d̠, etc.; palatalized ʃ, ʒ: ʃ̠, ʒ̠. Velarized or pharyngealized consonants: ɬˠ, dˠ, zˠ, etc. Ejective consonants (with simultaneous glottal stop): pʼ, tʼ, etc. Implosive voiced consonants: ɓ, ɗ, etc. ɾ fricative trill. σ̟, o̟ (labialized θ, ð, or s, z). l̠, ʒ̠ (labialized ʃ, ʒ). ɪ, ɾ̠, ɕ, ɓ (clicks, Zulu *c*, *q*, *x*). ɻ (a sound between r and l). ŋ Japanese syllabic nasal. ɧ (combination of x and ʃ). ʍ (voiceless w). ɪ, ɣ, ʊ (lowered varieties of i, y, u). ɜ (a variety of ə). ɔ (a vowel between ø and o).

Affricates are normally represented by groups of two consonants (ts, ʧ, dʒ, etc.), but, when necessary, ligatures are used (ts, ʧ, ʤ, etc.), or the marks ‿ or ⁀ (t͡s or t‿s, etc.). ‿ also denote synchronic articulation (m‿ŋ = simultaneous m and ŋ). c, ɟ may occasionally be used in place of ʧ, ʤ, and ʦ, ʣ for ts, dz. Aspirates plosives: ph, th, etc. r-coloured vowels: eɹ, aɹ, ɔɹ, etc., or eʳ, aʳ, ɔʳ, etc., or e˞, a˞, ɔ˞, etc.; r-coloured ə : əɹ or əʴ or ɹ or ə˞ or ɚ.

LENGTH, STRESS, PITCH.—ː(full length). ˑ(half length). ˈ(stress, placed at beginning of the stressed syllable). ˌ(secondary stress). ˉ(high level pitch); ˍ(low level); ˊ(high rising); ˎ(low rising); ˋ(high falling); ˏ(low falling); ˆ(rise-fall); ˇ(fall-rise).

MODIFIERS.—˜nasality. ˔breath (l breathed ɪ. ˬvoice (s̬ = z). ʻslight aspiration following p, t, etc. ˷labialization (n̪ = labialized n). ˽dental articulation (t̪ = dental t). ˀpalatalization (ż = ʒ). ˹specially close vowel (e̝ = a very close e). ˺specially open vowel (e̞ = a rather open e). ˖(tongue raised (c˖ or ç̟ = ç). ˗tongue lowered (e˗ or e̠ = ç). ˖tongue advanced (u˖ or u̟ = an advanced u, ʇ = t̟).- or ‾ (tongue retracted (i- or i̠ = i̟˗, t̠ = alveolar t), ʾlips more rounded. ʿlips more spread. Central vowels: ï(= i), ü(= u, ö(= ə˖), ö(= o, ë, ɔ̈. ˷(e.g. n̥) syllabic consonant. ˞consonantal vowel. ʃˢ variety of ʃ resembling s, etc.

Figure 1 The International Phonetic Alphabet (revised to 1951).

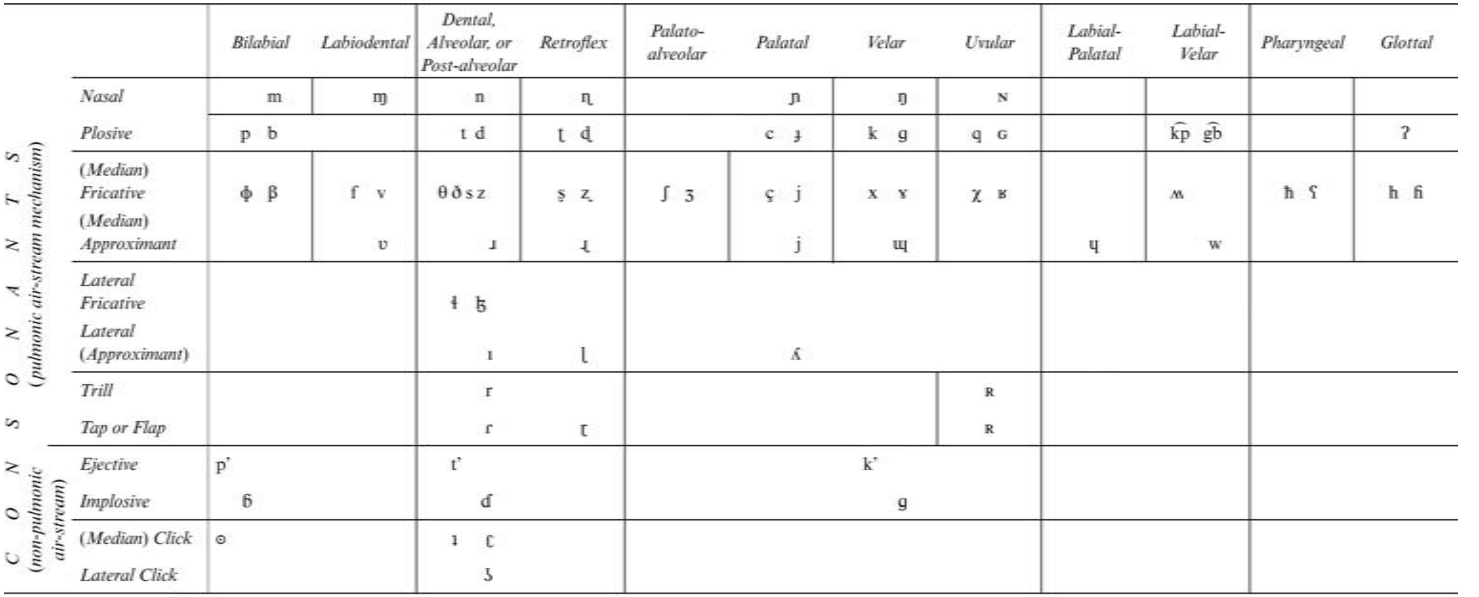


Figure 2 The International Phonetic Alphabet (revised to 1979).

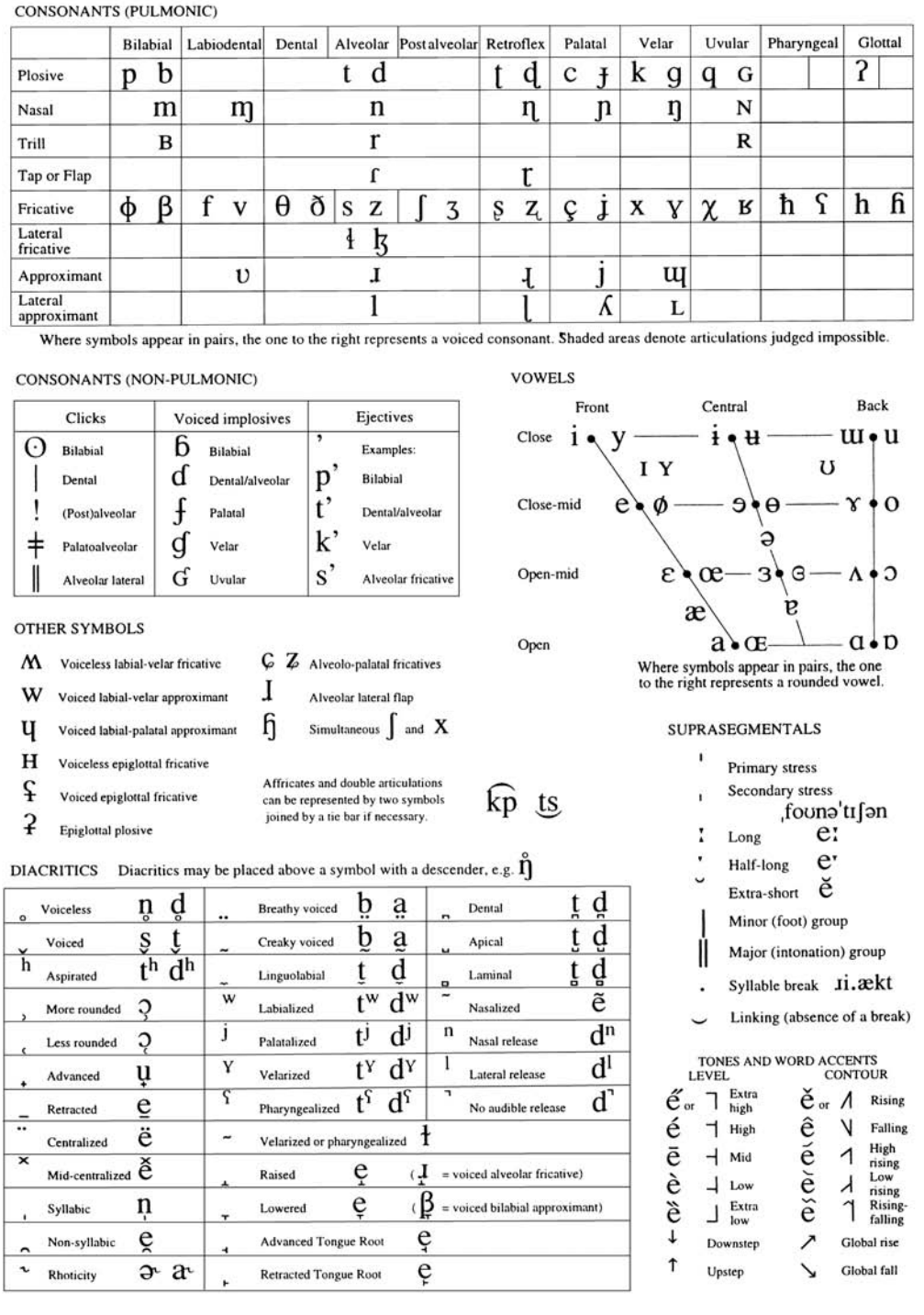


Figure 3 The International Phonetic Alphabet (revised to 1993, updated 1996).

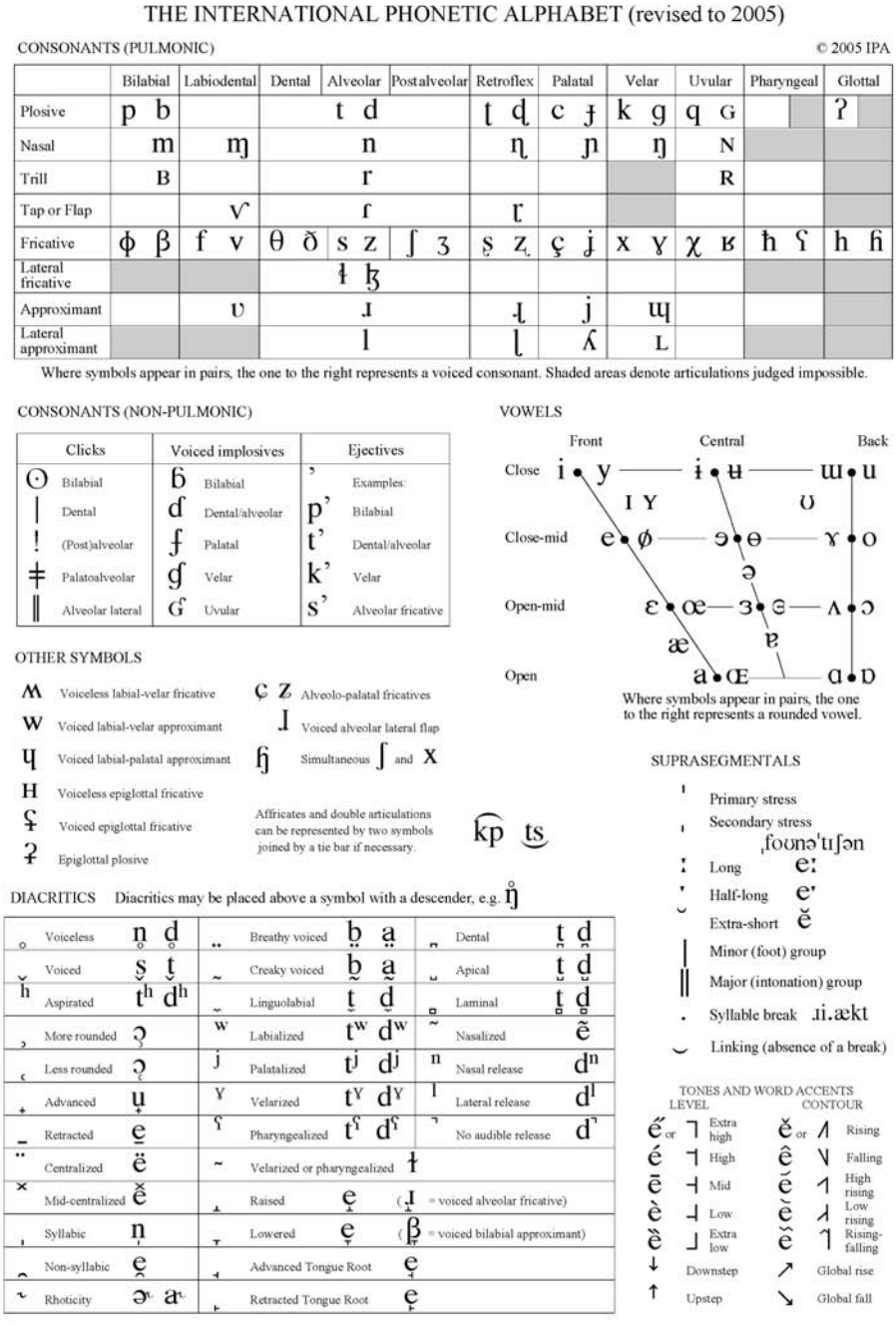


Figure 4 The International Phonetic Alphabet (revised to 2005).

There are many sounds which are capable of being made, but for which there are no IPA symbols – labiodental plosives or alveolar approximants, for example. In such cases, an ad hoc method must be used by individual scholars for indicating such sounds. In due course, the IPA may decide to provide suitable symbols.

It will be noticed that some 'boxes' of the charts contain no symbols. There are two possible reasons for this: one that the sound is a physiological impossibility (e.g., a nasal lateral); the other that, as far as is known, such a sound, even though it may be pronounceable, is not used as a separate phoneme in any language.

Almost all the symbols and diacritics are assigned specific, unambiguous articulatory or phonatory values. Thus, in the word *cease* /s/ at the beginning and at the end of the syllable are the same, and must therefore be written in the same way. This principle may lead to difficulties, however, in interpreting correctly the actual phonetic quality of an allophone. For example, the symbol /t/ gives the impression that its allophones will likely be at or close to the alveolar place of articulation. Yet, for many speakers of English, one of the allophones of /t/ in certain phonological contexts is the glottal plosive [ʔ]. The use of the bracketing conventions, / / for phonemes, and [ ] for allophones, can assist in resolving any ambiguity.

Where the same symbol comes to be used for more than one sound (e.g., ʀ for a uvular tap as well as a uvular trill), the explanation lies either in the fact that no phonemic contrast exists between the sounds in question, or in the opinion of the IPA the contrast is not sufficiently widespread in the world's languages to justify devising extra symbols.

The choice of symbols in the alphabet is based as far as possible on the set of 'ordinary letters of the roman alphabet', with 'as few new letters as possible' being used. A glance at the chart reveals that most of the symbols are either roman or adjustments of roman characters, for example by being inverted or reversed: ɹ is a turned r, ɔ a turned c; and so on. Symbols from other alphabets have been introduced, for example θ and χ from Greek, but the appearance of the typeface has been adjusted so that it harmonises visually with the roman characters. Only when the roman alphabet has been exhausted have special, non-alphabetic characters been used: for example on the 1989 and 2005 charts the diacritics for tone and word accent, and ʒ, an alternative symbol for the voiceless alveolar affricate ts on the 1951 chart.

The alphabet may be written in two forms: either as handwritten approximations to the printed characters or in specially devised cursive forms. (The latter option is now rare. The *Principles of the International Phonetic Association* (1949) gives examples.)

Before the advent of computers with embedded phonetic fonts, certain sorts of typewriter were available, equipped with many of the IPA symbols and diacritics: for example, electric typewriters with 'golfball' typing heads. That technology has been completely superseded by the software for a wide range of phonetic fonts, either the full set or sections thereof, in a variety of typefaces. All of the IPA's current set of symbols and diacritics, as well as some earlier symbols, have been incorporated into Unicode.

Illustrations of the alphabet for connected texts can be found most conveniently in the *Handbook of the International Phonetic Association* (1999), where twenty-nine languages are illustrated.

The 2005 chart draws a distinction between two types of consonant (pulmonic and non-pulmonic) and vowels. Other categories are 'other symbols' (a group of particular consonants), diacritics, and suprasegmentals (with a subdivision for tones and word accents). Despite some inherent illogicality, the arrangement is intended to reflect the practical requirements of the user.

For the symbolisation of consonants, the traditional articulatory phonetic parameters of **place of articulation**, **manner of articulation** and **state of the glottis** are employed.

On the 2005 chart, there are eleven places of articulation in the pulmonic consonants section, with five others to be found across the non-pulmonic consonants and 'other symbols'. From the time of the 1951 alphabet, there has been some variation in the way in which certain places (e.g., palato-alveolar) have been assigned to the different sections of the chart. However, there has been consistency in the allocation of voiceless sounds to the left-hand side of a 'box', and voiced to the right-hand side.

Certain differences of terminology, especially for manners of articulation are evident among the various charts: cf. lateral non-fricative (1951)

and lateral approximant (1979 and later); rolled (1951) and trill (1979 and later); and frictionless continuant and semi-vowel (1951) and approximant (1979 and later), etc. Other differences between the charts include the removal of certain symbols and the introduction of new ones: e.g., ʊ (labialised θ) and ɪ and ʊ were replaced in 1979 by ɪ and ʊ; and ⱱ (voiced labiodental flap) was officially adopted in 2005. The orientation of the vowel diagram has altered since 1979.

It is only in the symbolisation of certain sounds that a consistent graphic principle can be found. All the nasal symbols are constructed as variants of the letter 'n'; and all the retroflex symbols have a descender below the x-line curling to the right. All the implosive symbols have a hook on top; and all ejectives have an apostrophe following the symbol.

As indicated above, the great majority of the symbols and diacritics used in the alphabet are for notating the segments of speech. The post-1979 charts have begun to provide symbolisations for particular phonation types. Even so, internationally agreed notations are still lacking for certain other aspects of speech, such as additional phonation types, tempo, rhythm, and voice qualities. In view of the emphasis on segmental phonemic notation in the alphabet, however, such a gap is understandable.

An earlier development of the alphabet was **International Phonetic Spelling**. Its purpose was to provide an orthographic representation of a language such that the pronunciation and the spelling system were brought into closer line with each other. An example, taken from the *Principles* (1949), is the spelling of the English clause *weak forms must generally be ignored* as 'wiik formz məst ʒenəlrali bi ignord'. International Phonetic Spelling can be seen, then, as an alternative, but more phonemically realistic, roman-based reformed orthography. Examples of such an orthography for English, French, German and Sinhalese can be found in the *Principles*.

Another extension of the Association's alphabet has been **World Orthography**, which, like International Phonetic Spelling, is a means of providing hitherto unwritten languages with a writing system. Its symbols are almost the same as those of the 1951 alphabet.

M. K. C. M.

Suggestions for further reading

Abercrombie, D. (1967) *Elements of General Phonetics*, Edinburgh, Edinburgh University Press, pp. 111–32.

International Phonetic Association (1999) *Handbook of the International Phonetic Association: A Guide to the Use of the International Phonetic Alphabet*, Cambridge: Cambridge University Press.

MacMahon, M.K.C. (1986) 'The International Phonetic Association: The First 100 Years', *Journal of the International Phonetic Association*, 16: 30–8.

[n.a.] (1949) *Principles of the International Phonetic Association*, London, Dept. of Phonetics, University College, London.

Interpretive semantics

The label **interpretive semantics** is used for any approach to generative grammar that assumes that rules of semantic interpretation apply to already generated syntactic structures. It was coined to contrast with **generative semantics** [*see* GENERATIVE SEMANTICS], which posits that semantic structures are directly generated and then undergo a transformational mapping to surface structure. Confusingly, however, while 'generative semantics' is the name of a particular framework for grammatical analysis, 'interpretive semantics' is only the name for an approach to semantic rules *within* a set of historically related frameworks. Thus there has never been a comprehensive theoretical model of interpretive semantics as there has been of generative semantics.

After the collapse of generative semantics in the late 1970s, virtually all generative grammarians adopted the interpretive-semantic assumption that rules of interpretation apply to syntactic structures. Since the term no longer singles out one of a variety of distinct trends within the field, it has fallen into disuse.

Followers of interpretive semantics in the 1970s were commonly referred to simply as **interpretivists** as well as by the more cumbersome **interpretive semanticists**. A terminological shortening has been applied to the name for the approach itself: any theory that posited rules of semantic interpretation applying to syntactic structures is typically called an **interpretive theory**.

The earliest generative treatment of semantics, Katz and Fodor's (1963) paper 'The Structure of a Semantic Theory', was an interpretive one. The goals they set for such a theory were to underlie all subsequent interpretive approaches to semantics and, indeed, have characterised the majority position of generative grammarians in general with respect to meaning. Most importantly, Katz and Fodor drew a sharp line between those aspects of sentence interpretation deriving from linguistic knowledge and those deriving from beliefs about the world; that is, they asserted the theoretical distinction between **semantics** and **pragmatics** [*see* SEMANTICS; PRAGMATICS].

Katz and Fodor motivated this dichotomy by pointing to sentences such as *Our store sells horse shoes* and *Our store sells alligator shoes*. As they pointed out, in actual usage, these sentences are not taken ambiguously – the former is typically interpreted as ' … shoes for horses', the latter as ' … shoes made from alligator skin'. However, they argued that it is not the job of a semantic theory to incorporate the purely cultural, possibly temporary, fact that shoes are made for horses, but not for alligators, and that shoes are made out of alligator skin, but not often out of horse hide (and, if they are, we call them 'leather shoes'). Semantic theory, then, would characterise both sentences as ambiguous – the only alternative, as they saw it, would be for such a theory to incorporate all of human culture and experience.

Katz and Fodor thus set the tone for subsequent work in interpretive semantics by assuming that the semantic component of the grammar has responsibility for accounting for the full range of possible interpretations of any sentence, regardless of how world knowledge might limit the number of interpretations actually assigned to an utterance by participants in a discourse.

Katz and Fodor also set a lower bound for their interpretive theory; namely, to describe and explain speakers' ability to determine the number and content of the readings of a sentence; to detect semantic anomalies; to decide on paraphrase relations between sentences; and, more vaguely, to mark 'every other semantic property that plays a role in this ability' (1963: 176).

The Katz and Fodor interpretive theory contains two components: the **dictionary**, later called the **lexicon**, and the **projection rules**. The former contains, for each lexical item, a characterisation of the role it plays in semantic interpretation. The latter determines how the structured combinations of lexical items assign a meaning to the sentence as a whole.

The dictionary entry for each item consists of a **grammatical portion** indicating the **syntactic category** to which it belongs, and a **semantic portion** containing **semantic markers**, **distinguishers** and **selectional restrictions**. The semantic markers and distinguishers each represent some aspect of the meaning of the item, roughly corresponding to **systematic** and **incidental** aspects, respectively. For example, the entry for *bachelor* contains markers such as (Human), (Male), (Young), and distinguishers such as [Who has never married] and [Who has the first or lowest academic degree]. Thus a Katz and Fodor lexical entry very much resembles the product of a componential analysis [*see* SEMANTICS].

The first step in the interpretation of a sentence is the plugging in of the lexical items from the dictionary into the syntactically generated **phrase-marker** [*see* GENERATIVE GRAMMAR]. After insertion, **projection rules** apply upwards from the bottom of the tree, amalgamating the readings of adjacent nodes to specify the reading of the node that immediately dominates them.

Since any lexical item might have more than one reading, if the projection rules were to apply in an unconstrained fashion, the number of readings of a node would simply be the product of the number of readings of those nodes which it dominates. However, the selectional restrictions forming part of the dictionary entry for each lexical item serve to limit the amalgamatory possibilities. For example, the entry for the verb *hit* in the Katz–Fodor framework contains a selectional restriction limiting its occurrence to objects with the marker (Physical Object). The sentence *The man hits the colourful ball* would thus be interpreted as meaning ' … strikes the brightly coloured round object', but not as having the anomalous reading ' … arrives at the gala dance', since *dance* does not contain the marker (Physical Object).

In the years following the appearance of Katz and Fodor's work, the attention of interpretivists turned from the question of the character of the

semantic rules to that of the syntactic level most relevant to their application.

An attractive solution to this problem was put forward in Katz and Postal's book, *An Integrated Theory of Linguistic Descriptions* (1964). They concluded that all information necessary for the application of the projection rules is present in the deep structure of the sentence or, alternatively stated, that transformational rules do not affect meaning. This conclusion became known simply as the **Katz–Postal hypothesis**.

The Katz–Postal hypothesis received support on several grounds. First, rules such as **Passive** distort the underlying grammatical relations of the sentence relations that quite plausibly affect its semantic interpretation. Hence, it seemed logical that the projection rules should apply to a level of structure that exists before the application of such rules, i.e. they should apply to deep structure. Second, it was typically the case that discontinuities were created by transformational rules (*look … up*, *have … en*, etc.) and never the case that a discontinuous underlying construction became continuous by the application of a transformation. Naturally, then, it made sense to interpret such constructions at an underlying level where their semantic unity is reflected by syntactic continuity. Finally, while there were many motivated examples of transformations which deleted elements contributing to the meaning of the sentence – the transformations forming imperatives and comparatives, for example – none had been proposed which inserted such elements. The rule which Chomsky (1957) had proposed to insert meaningless supportive *do* was typical in this respect. Again, this fact pointed to a deep-structure interpretation.

The hypothesis that deep structure is the sole input to the semantic rules dominated interpretive semantics for the next five years and was incorporated as an underlying principle by its offshoot, generative semantics. Yet there were lingering doubts throughout this period that transformational rules were without semantic effect. Chomsky expressed these doubts in a footnote in *Aspects of the Theory of Syntax* (1965: 224), where he reiterated the feeling he had expressed in *Syntactic Structures* (1957) that *Everyone in the room knows at least two languages* and *At least two languages are known by everyone in the room* differ in meaning. Yet he considered that both interpretations might be 'latent' in each sentence. Ten years later he gave his doubts even stronger voice, though he neither gave specific examples nor made specific proposals: 'In fact, I think that a reasonable explication of the term "semantic interpretation" would lead to the conclusion that surface structure also contributed in a restricted but important way to semantic interpretation, but I will say no more about the matter here' (1967: 407).

In the last few years of the 1960s there was a great outpouring of examples from Chomsky and his students, which illustrated superficial levels of syntactic structure playing an important role in determining semantic interpretation. Taken as a whole, they seemed to indicate that any strong form of the Katz–Postal hypothesis had to be false – everything needed for semantic interpretation was *not* present in the deep structure. And, while these facts might still allow one, legalistically, to maintain that transformations do not change meaning, the conclusion was inescapable that all of meaning is not determined before the application of the transformational rules. For example, Jackendoff (1969) cited the contrast between (1a) and (1b) as evidence that passivisation has semantic effects:

1. (a) Many arrows did not hit the target.
   (b) The target was not hit by many arrows.

The scope of *many* appears wider than that of *not* in (1a), but narrower in (1b). Jackendoff also argued that the rule proposed in Klima (1964) to handle simple negation, which places the negative before the finite verb, is also meaning-changing. As he observed, (2a) and (2b) are not paraphrases; the negative in (2a) has wider scope than the quantifler, but the reverse is true in (2b):

2. (a) Not much shrapnel hit the soldier.
   (b) Much shrapnel did not hit the soldier.

In fact, it appeared to be *generally* the case that the scope of logical elements such as quantifiers and negatives is determined by their respective order in surface structure. Thus, the scope of the word *only* in (3a) is the subject, *John*, while in (3b) it may be the whole verb phrase, or just the verb, or just the object, or just one subconstituent of the object:

3. (a) Only John reads books on politics.
   (b) John only reads books on politics.

Observations like these led Chomsky, Jackendoff and others to propose rules taking surface structures as their input and deriving from those surface structures the representation of the scope of logical elements in the sentence. Nevertheless, it was clear that not *all* interpretation takes place on the surface. For example, in sentences (1a) and (1b), the semantic relation between *arrows*, *hit* and *target* is the same. Indeed, it appeared to be generally the case that the main propositional content of the sentence – the semantic relationship between the verb and its associated noun phrases and prepositional phrases – does not change under transformation. Hence, it made sense to continue to interpret this relationship at the level of deep structure.

By 1970, the term 'interpretive semantics' had come to be used most commonly to refer to the idea that interpretive rules apply to both deep and surface structures, rather than to deep structures alone. Nevertheless, Katz (1972) maintained only the latter approach to interpretive rules and, therefore, quite understandably, he continued to use the term 'interpretive semantics' to refer to his approach.

Figure 1 depicts the model that was posited by the great majority of interpretivists in the early 1970s.

The most comprehensive treatment of the interpretive semantic rules in the early 1970s was Ray Jackendoff's *Semantic Interpretation in Generative Grammar* (1972). For Jackendoff, as for interpretivists in general, there was no single formal object called a 'semantic representation'. Rather, different types of rules applying at different levels 'filled in' different aspects of the meaning. Jackendoff posited four distinct components of meaning, each of which was derived by a different set of interpretive rules:

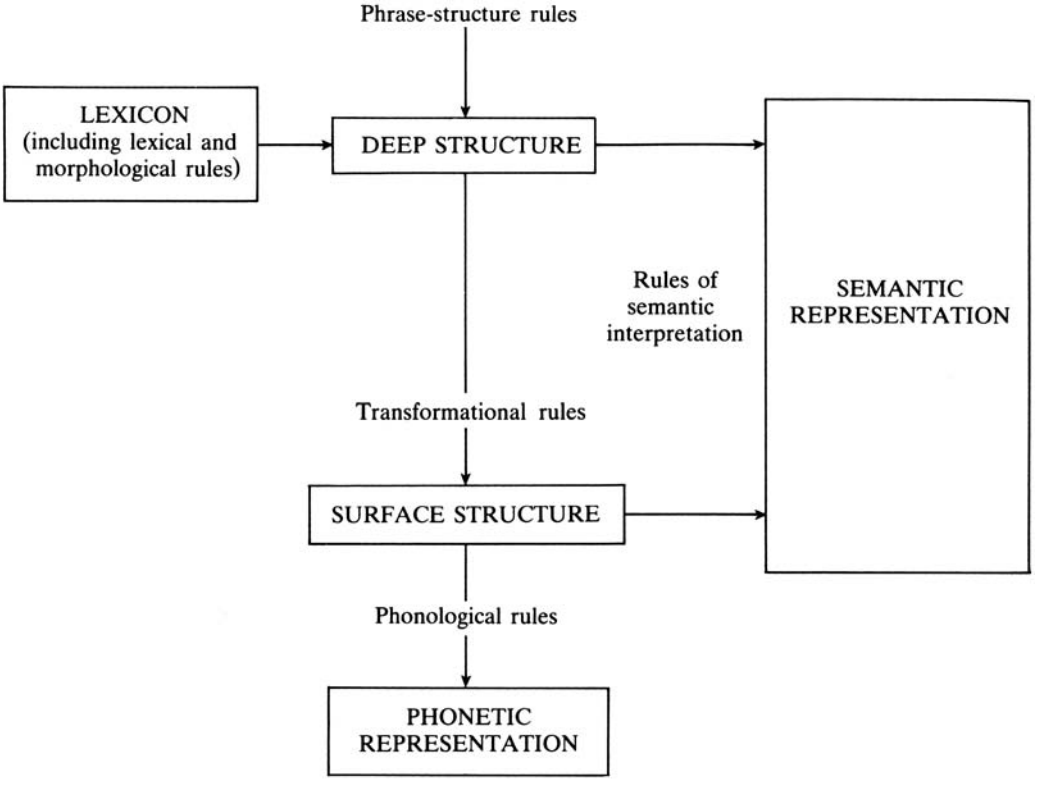


Figure 1

4. (a) *Functional structure* – the main propositional content of the sentence.
   (b) *Modal structure* – the specification of the scope of logical elements such as negation and quantifiers, and of the referential properties of noun phrases.
   (c) *The table of coreference* – the specification of which noun phrases in a sentence are understood as coreferential.
   (d) *Focus and presupposition* – the designation of what information in the sentence is understood as new and what is understood as old.

Functional structure is determined by **projection rules** applying to deep structure. Thus, the semantic relationship between *hit*, *arrows* and *target* in (1a) and (1b) could be captured in part by rules such as (5a) and (5b), the former rule interpreting the deep-structure subject of both sentences as the semantic agent, and the latter rule interpreting the deep-structure object of both sentences as the semantic patient:

5. (a) Interpret the animate deep-structure subject of a sentence as the semantic agent of the verb.
   (b) Interpret the deep-structure direct object of a sentence as the semantic patient of the verb.

In **modal structure** are represented relationships such as those between *many* and *not* in (1a) and (1b). A rule such as (6) captures the generalisation that the scope of the quantifier and the negative differs in these two sentences:

6. If logical element A precedes logical element B in surface structure, then A is interpreted as having wider scope than B (where 'logical elements' include quantifiers, negatives and some modal auxiliaries).

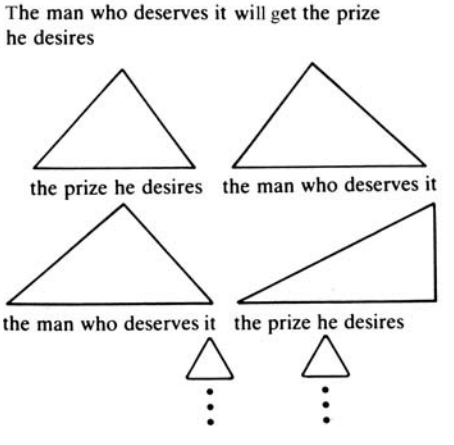
Jackendoff's third semantic component is the **table of coreference**. Indeed, by 1970, all interpretive semanticists agreed that **interpretive rules** state the conditions under which anaphoric elements such as pronouns are understood as being coreferential with their antecedents. This represented a major departure from the work of the preceding decade, in which it was assumed that pronouns replace full noun phrases under identity with another noun phrase by means of a transformational rule (see, for example, Lees and Klima 1963). In this earlier work, (7b) was derived from (7a) by means of a **pronominalisation transformation** that replaced the second occurrence of *John* in (7a) by the pronoun *he* (the indices show coreference):

7. (a) John_i thinks that John_i should win the prize.
   (b) John_i thinks that he_i should win the prize.

However, by the end of the 1960s, it came to be accepted that such an approach faced insuperable difficulties. The most serious problem involved the analysis of the famous class of sentences discovered by Emmon Bach and Stanley Peters and therefore called **Bach–Peters sentences**, involving **crossing coreference**. An example from Bach (1970) is:

8. $[\text{The man who deserves it}_j]_i$ will get $[\text{the prise he}_i \text{ desires}]_j$.

If pronominalisation were to be handled by a transformation that turned a full noun phrase into a pronoun, then sentence (8) would require a deep structure with an infinite number of embeddings, since each pronoun lies within the antecedent of the other:


The man who deserves it will get the prize he desires
the prize he desires
the man who deserves it
the man who deserves it
the prize he desires

Interpretivists concluded from Bach–Peters sentences that infinite deep structures could be avoided only if definite pronouns were present in the deep structure, which, in turn, implied the

existence of an interpretive rule to assign coreferentiality between those base-generated pronouns and the appropriate noun phrases. Such a rule was posited to apply to the surface structure of the sentence.

Finally, surface structure was also deemed the locus of the interpretation of such discourse-based notions as **focus** and **presupposition**. In support of this idea, Chomsky (1971) noted that focusable phrases are *surface structure* phrases. This point can be illustrated by the question in (10) and its natural responses (11a–c). In each case, the focused element is in a phrase that did not even exist at the level of deep structure, but rather was formed by the application of a transformational rule. Therefore the interpretation of focus and presupposition must take place at surface structure:

10. Is John certain to win?
11. (a) No, he is certain to *lose*.
    (b) No, he's likely not to be *nominated*.
    (c) No, the election won't ever *happen*.

While the Jackendovian model outlined above is the best-known 1970s representative of interpretive semantics, it proved to have a rather short lifespan. In particular, by the end of the decade most generative grammarians had come to conclude that no rules of interpretation at all apply to the deep structure of the sentence. Chomsky (1975b) noted that, given the **trace theory** of movement rules (Chomsky 1973), information about the functional structure of the sentence is encoded on the **indexed traces** and carried through the derivation to surface structure. Hence, functional structure as well could be determined at that level. On the other hand, Brame (1976), Bresnan (1978) and others challenged the very existence of transformational rules and thus, by extension, of a level of deep structure distinct from surface structures. Given such a conclusion, then, necessarily all rules of semantic interpretation would apply to the surface.

The consensus by the end of the 1970s that semantic rules are interpretive rules applying to surface structure stripped the term 'interpretive semantics' of informational content. In its place, labels began to be used that referred to the distinctive aspects of the various models of grammatical analysis. Thus, the Chomskian wing of interpretivism was commonly known as the **extended standard theory** (**EST**) or **trace theory**, which itself by the 1980s had developed into the **government–binding theory** and in the 1990s into the **minimalist programme**. The rival interpretivist wing is now represented by such transformation-less models as **lexical-functional grammar** (Bresnan 2001) and **head-driven phrase-structure grammar** (Sag et al. 2003).

F. J. N.

Suggestions for further reading

Bresnan, J.W. (2001) *Lexical-Functional Syntax*, Oxford: Blackwell.
Chomsky, N. (1965) *Aspects of the Theory of Syntax*, Cambridge, Mass.: MIT Press.
— (1972) *Studies on Semantics in Generative Grammar*, The Hague: Mouton.
— (1977) *Essays on Form and Interpretation*, New York: North Holland.
Newmeyer, F.J. (1986) *Linguistic Theory in America: The First Quarter Century of Transformational Generative Grammar*, 2nd edn, New York: Academic Press; especially Chapters 4 and 6.
Sag, I.A., Wasow, T., and Bender, E.M. (2003) *Syntactic Theory: A Formal Introduction*, 2nd edn, Stanford, Calif.: CSLI Publications.

Intonation

Intonation is typically defined as the systematic and linguistically meaningful use of pitch movement at the phrasal or **suprasegmental** level. In this way, intonation is contrasted with **tone** which refers to the linguistically meaningful use of pitch movement at the **lexical** level in languages such as Chinese or Vietnamese. This narrow definition of intonation is usually expanded, particularly in pedagogical treatments, to encompass stress and intonation group analysis, i.e. the alignment of word groups and pitch contours. This broader definition recognises that meaning-bearing elements of the intonation contour select sites of lexical stress and that intonation contours defined by pitch movement often coincide with phrasal or clausal groups separated by pauses. Thus, **intonology** is

concerned with subjective perceptions of **pitch**, **stress** and **pause** and their equivalent acoustic parameters of **fundamental frequency** (F0), **intensity** (volume) and **duration** (both vowel and pause lengths).

A consensus has yet to be reached as to the precise description and unique functions of the intonation systems of languages. In perhaps the most comprehensive survey of intonation systems comprising more than twenty languages, Hirst and Di Cristo (1998) outline some of the issues involved in creating a '**prosodic typology**'. These include the difficulty of integrating findings from research traditions employing different theoretical frameworks and transcription systems and embracing the very different pitch and stress characteristics of languages as typologically different as English and Chinese. As an illustration of the kinds of concerns that are typically addressed in models of intonation, the following discussion summarises the history of English intonation study and the current state of the field.

The analysis of the intonation system in English is commonly divided into two broad traditions: British and American. Perhaps the most influential early twentieth-century phonetician was Henry Sweet (1878, 1892) whose **tonal analysis** became the basis for much of the later work in the British tradition. Sweet identified five possible tones, three **single tones** (level, rise and fall) and two **compound tones** (rise–fall and fall–rise). Each tone projected a largely attitudinal meaning, and labels varied quite widely. A rising tone, for instance, could indicate 'an expectant or suspensive attitude' or communicate 'a character of cheerfulness or geniality' (1892: 39). Palmer (1922b) added the **tone group** as the unit within which the five tones functioned. This was a group of words usually separated by pauses which comprised three segments: the **nucleus** (the stressed or prominent syllable), the **head** which consisted of anything before the nucleus and the **tail** which included anything after it. Over the next few decades, intonologists added the **prehead** to Palmer's original categories. The resulting structure is shown in Table 1 (adapted from Tench 1996: 12).

A second, pedagogically oriented system was developed several years after Palmer's work by Armstrong and Ward (1926). They posited two basic **tunes** with a limited number of variations. Tune I was a falling tone used in declarative statements and commands, and Tune II was a rising tone signalling uncertainty or incompleteness. Although this kind of contour analysis continued in the work of O'Connor and Arnold (1961/1973), it is fair to say that it has been eclipsed in more recent approaches by **componential** systems.

One of the most significant contributions to intonation in the British tradition was made by Halliday (1967) as part of his framework of **systemic grammar**. Systemic grammar unites form and function, and begins with the general principle that intonational contrasts are grammatical in nature and can be shown to be as independently formalised as syntactic choices. Intonation structure comprises three separate systems: **tonality** (tone unit division), **tonicity** (internal structure of tone units) and **tone** (pitch movement on the final tonic). Together, the systems unite syntactic, prosodic and information structure. Halliday proposes a marked/unmarked distinction in which unmarked **tone units** comprising prosodic feet are coextensive with information units and syntactic clauses. The internal structure of the tone unit comprises 'given' information followed by a 'new' or focal element coinciding with the **tonic syllable** on the last lexical item of the tone unit. The tonic syllable carries one of five possible tones, and a number of **secondary tones** may appear on both the tonic and pretonic to indicate affective meaning.

In the following example, the tone group (indicated by a double slash) is divided into rhythmic feet (indicated by a single slash); each foot contains one stressed syllable and one or more unstressed syllables. The pretonic segment, comprising everything before the tonic, 'mind', carries the secondary tone marked by the full stop and specifying a 'neutral' pretonic. The tonic also carries a neutral, falling tone [1] and is glossed as 'unemotional'. Thus, the symbols

Table 1

Pre-head	Head	Nucleus	Tail
a	DOG is a person's best	FRIEND	I reckon

describe 'tone 1 with neutral pretonic and neutral tonic' (Halliday 1970: 14).

> //.1 why don't you/ make up your/ *mind*//
>
> (Halliday 1970: 32)

Halliday's model remains in use, and although researchers continue to disagree as to its internal structure and its pragmatic meaning, the basic concept of the tone group or tone unit continues to be the unit of analysis in much British English work to the present day.

A somewhat different tradition developed in American linguistics. The influential structural theorist Bloomfield (1933) regarded intonation and stress as **secondary phonemes** both because they could not be attached to a particular segment and because he regarded intonation as a 'modification' of speech. Thus, much of the work that directly followed Bloomfield was concerned with assuring the status of stress and intonation as distinctive linguistic features. The most thorough description of the system at that time was given by Pike (1945) whose comprehensive **phonemic** treatment of intonation, stress and pause and accompanying transcription methods assured prosodic features a place in mainstream linguistics. Pike posited four relative but significant levels of pitch. These **pitch phonemes** were described as the basic building blocks for intonation contours and shown as a series of connected numbers representing the particular levels, e.g., 2–4; 1–3. In addition, he stipulated two **pause phonemes** – a tentative and a final pause. In terms of function, Pike viewed intonation as attitudinal. He listed approximately thirty primary contours, and a number of modifications variously labelled in attitudinal terms such as 'endearment', 'detachedness', and 'incomplete deliberation'. A strong critic of this kind of analysis was another American, Bolinger, who argued that pitch levels themselves were not meaningful and that **configuration** was the key: 'the basic entity of intonation is the pattern … the fundamental, down to earth sense of a continuous line that can be traced on a piece of paper' (1951: 206).

With the publication of *The Sound Patterns of English* (Chomsky and Halle 1968) intonation was again consigned to the edge of linguistics and purposefully omitted by the authors. Some generative scholars attempted to generate intonational contours via transformational rules; however, this was problematic as there was no way to incorporate the acknowledged attitudinal function of intonation. As a way to manage this difficulty, researchers attempted to separate out 'linguistic' and 'non-linguistic' aspects of intonation and ignored the latter.

As these traditions demonstrate, two distinct approaches emerged in English intonation analysis. While the British tradition was criticised for a lack of a theoretical basis and an oversimplification of description, the American system, which had a strong theoretical basis, tended to characterise as 'extralinguistic' those features that did not fit neatly into the proposed framework. From a pedagogical perspective, Levis (2005) suggests that current materials and approaches continue to reflect these different orientations. He notes a bias toward **description** in British English-based materials and **prescription** in equivalent American English texts.

Despite these differences, significant agreement has been reached on both sides of the Atlantic regarding the **multifunctional role** of intonation in discourse (Chun 2002; Tench 1996). The **grammatical function** of intonation encompasses a number of structures including the use of a final rising or falling pitch to distinguish utterances as statements or questions, and the employment of tone unit and pause structure to disambiguate relative clauses such as:

> //My sister who lives in Connecticut is the oldest// the youngest lives in California//
> //My sister// who lives in Connecticut// is coming for Thanksgiving//

As previously noted, the **attitudinal function** of intonation is widely recognised. However, more recent treatments of intonation have followed Crystal (1969) in emphasising that care needs to be taken in separating intonational effects from the effects of the lexical items themselves. While it is clear that intonation has an affective function, there is a danger in applying too many precise labels and unnecessarily complicating the tonal inventory. Affective meaning is communicated by a cluster of **prosodic** and

paralinguistic variables that include loudness, stress, rate, kinesics and contextual expectation among others.

The **discourse or textual function** of intonation encompasses both **informational** and **interactional** aspects of pitch and pause structure. Production and perception studies investigating the role of discourse prosodics in information-structuring suggest that systematic pitch and pause characteristics are linked to topic structure at both the local (utterance) level and global (discourse) level. Speakers use pitch range and pause length to mark boundary strength, and listeners use prosodic cues to parse incoming information and predict up-coming discourse structure (Cutler et al. 1997). Non-referential or interactional functions of intonation include the use of pitch variation to regulate turn-taking in conversation, to communicate sociolinguistic information such as status differences, solidarity or social distance between interlocutors and in general terms to contribute to relationship-building between discourse participants. Research additionally points to an **indexical function** of intonation associated with the use of specific intonational patterns to mark a speaker's affiliation with a regional or socio-cultural group. Among the most notorious patterns discussed in both the linguistic and non-linguistic press is the **high-rising terminal tone** (HRT) also variously known as *Valley girl*, *Mallspeak*, *Uptalk* or *Upspeak*.

Much of the most recent research regarding intonation has also taken advantage of increased access to technology. Historically, assessments of pitch movements relied on the impressionistic judgment of the intonologist, while developments in the field of **acoustic phonetics** had little impact on theories of intonation. However, rapid improvements in digital speech processing and synthesised speech have encouraged researchers to bridge the gap between model building and the physical correlates of intonation. This is not without its difficulties. As is true of any model where a fit is attempted between theoretical categories and actual data, particularly phonetic realisations of gradient phenomena such as pitch change, decisions must be warranted and reliable enough to be replicated. Thus, although it is becoming progressively more common to see instrumental support in the form of phonetic diagrams for claims of significant theoretical primitives, the use of instrumentation and the importance it is given in terms of support for any given claim varies considerably among researchers.

The most recent models of intonation structure and function are exemplified below in a discussion of two different yet comprehensive frameworks developed by David Brazil (1985, 1997) and Janet Pierrehumbert (1980/1987). The models evolved with very different purposes in mind. Brazil's model closely follows the British functionalist and pedagogical traditions and prioritises the description of naturally occurring discourse. His concerns are to both elucidate the role of intonation in communication and develop a model that can be used as a basis for teaching English intonation to language learners (as evidenced by his 1994 publication, *Pronunciation for Advanced Learners of English*). Pierrehumbert, on the other hand, follows the American, generative tradition. She builds a theoretical model of **intonational phonology** using language examples largely created and tested in the laboratory. Theoretical primitives and phonetic implementation rules allow the complete phonetic contour to be reconstructed, and applications of this model have included work in synthesised speech. Despite these very different orientations, where both models address the pragmatic function of intonation in discourse, they reach similar conclusions. It should be noted, however, that this has been a comparatively limited concern of the American model in contrast to its importance for Brazil's **discourse intonation** model.

Brazil proposes that intonation structure directly contributes to the **pragmatic** message of the discourse by linking the information to a world or context that the hearer can make sense of. The speaker chooses from a series of formal options which operate at the same level of abstraction as syntactic and lexical choices and have independent implications for discourse structure. The speaker's choices project a **context of interaction** based on the ongoing situated context of the discourse and the speaker's assessment of the hearer's knowledge state. As this context is constantly changing, intonation choices are relevant only at the moment of speaking, and the speaker is involved in a

continuous assessment of the relationship between the message and the hearer. Therefore, within the context of any given interaction, the participants are in the process of negotiating a **common ground** or background to which new or unknown information is added, contributing to the structure both within and between intonation units. It is this negotiation toward a **state of convergence**, a roughly mutual understanding of what is being said in the discourse, that allows for successful communication between participants.

In the British tradition of tonal analysis, Brazil adopts pitch-defined tone units. Unit boundaries are identified solely on the basis of pitch level and movement on stressed or **prominent** syllables. One or two points of prominence, representing the speaker's assessment of the relative information load carried by the elements in the utterance, are identified from the surrounding content. For example, given a potential tone unit such as 'a parcel of books lay on the table', at least two possible prominence selections could be made:

a. a parcel of BOOKS lay on the TAble
b. a PARcel of books lay on the TAble

In (a) the speaker presents a prominent choice of 'BOOKS' as opposed to, for example, flowers or cups, and makes a similar prominence choice regarding the location, i.e. on the table as opposed to on the floor or the chair. The choice of prominence on both syllables projects a context in which both these pieces of information are unrecoverable for the hearer. Equally, by choosing not to make prominent certain other words in the unit, the speaker assumes that this information is recoverable for the hearer, either because of non-linguistic factors, e.g., books can be assumed to lie on the table as opposed to stand up, or for linguistic factors, e.g., constraints on the language system limit the choice of function words such as 'of' and 'on'. In (b), a context is projected in which 'books' has already been negotiated between participants, but the two other prominence choices are new:

A: Was there a book on the doorstep when you came in?
B: There was a PARcel of books on the TABle.

Prominent syllables are divided into two categories based on where they appear in the tone unit and comprise the first prominent onset syllable (**key choice**) and the final tonic syllable (**termination choice**). Both key and termination choices are analysed using a three-term system (high, mid and low) that is based on relative pitch height for any given speaker. High pitch indicates that the material is contrastive or highlighted in relation to the surrounding information. Mid choices are glossed as additive and denote an expansion or enlargement of significant information. A low-pitch choice signifies a reformulation or 'equative' function indicating that no new information is added. In addition, low termination is used as a cue to the end of an interaction. In the following example of a typical teacher–student interaction, the student responds to the teacher's mid-key invitation with a mid key rather than a low key as this would imply the end of the exchange and no necessity for teacher feedback. The teacher confirms the correct answer with a mid-key repetition and closes the interaction with a positive evaluation with a low termination:

T: H
M //what's the final ANSwer?//
L
S: H
M //sixTEEN//
L
T: H
M //sixTEEN//
L //GOOD//

The third and final system, **tone choice**, is realised on the **tonic syllable**, the prominent syllable on which the maximum, **sustained pitch movement** is identified. There are five possible tone choices. Tones that end in falling movements (fall or rise–fall) are designated as **proclaiming** and contain new or asserted information. Tones with a rising movement (rise or fall–rise) are described as **referring** and mark information as already 'conversationally in play', i.e. assumed to be known or recoverable. Thus, tone choice summarises the common ground between speakers, i.e. what is assumed to be known and unknown in the context of any given interaction. A specific choice of tone can

also reflect sociolinguistic variables between discourse participants such as differences in social status or social distance. Brazil proposes that rise and rise–fall tones carry an additional value of **dominance**, and choice between these four tones is the prerogative of the controller of the discourse; for example, the teacher in teacher–student interaction. The final level, or **neutral** tone indicates a withdrawal from the unique context of any given interaction. In agreement with some previous treatments of the level tone, Brazil proposes that it is used in semi-ritualised or routinised language behaviour such as repeating formulas or equations or giving directives in the classroom (Brazil 1997: 138):

> //stop➔ WRITing ➔PUT your pens down//

Tone, key and termination are interlocking systems which combine to produce the **communicative value** of the utterance, and discourse genres can be characterised by particular kinds of prosodic composition. In teaching discourse, for example, the model predicts that a teacher will use a low termination and falling tone to end an exchange. Students, on the other hand, are likely to use a mid (agreement) key and rising tone in response to teacher elicitation to show that they are expecting teacher feedback.

In addition to the tone unit, Brazil identifies the **pitch sequence**. This is a second, larger unit of measurement which comprises a stretch of consecutive tone units that falls between two low termination choices and delineates longer sections of speech. Points of maximal disjunction (paragraph beginnings and endings) are marked with a high initial key and closed with a low final termination. Essentially equivalent to the paragraph in written discourse, it is consistent with other proposals describing larger units variously labelled as **speech paragraphs**, **intonational paragraphs**, or **major** and **minor paratones.**

Pierrehumbert's (1980/1987) approach to intonation in discourse is usually referred to as the **autosegmental-metrical** (AM) approach. In 1990, Pierrehumbert and Hirschberg published a paper that directly addressed the meaning of intonation in discourse as it was constituted using this model. In agreement with Brazil, they present an independent system which assigns a primarily pragmatic function to intonation choices: 'we propose that a speaker chooses a particular tone to convey a particular relationship between an utterance, currently perceived beliefs of a hearer and the anticipated contribution of subsequent utterances' (Pierrehumbert and Hirschberg 1990: 271).

Also similarly to Brazil's framework this is a **componential** model; however, individual components of the pitch contour are constituted within the tradition of **pitch phonemes** or **intonational morphemes**. Unlike the tonal contour analyses of the British tradition, the model comprises a series of static tones or **tonal targets** that together with a series of phonetic implementation rules, determine the shape of the pitch contour. There are two groups of tones: **pitch accents** and **boundary tones.** Pitch accents occur on stressed or 'salient' syllables and mark the information status of the lexical item on which they appear. High pitch accents (H*) mark the new information in the following (Pierrehumbert and Hirschberg 1990: 286):

> The train leaves at seven.
> H* H* H*

The second group of low and high tones associate with the right edge, or closing boundary of either intermediate phrases or intonational phrases (L%, H%). Phrases are identified by phonetic criteria and pausing, and as the end of an intonational phrase is also the end of an intermediate phrase, this creates four possible complex tones at the end of an utterance. The following exemplifies a typical declarative contour (Pierrehumbert and Hirschberg 1990: 286):

> The train leaves at seven.
> H* H* H* L L%

Final boundary tones also indicate whether a section of the discourse is complete. If completed, a low boundary tone marks off the semantically related sections of the discourse (LL%); if further discourse is required for its interpretation, a high boundary tone is used (HH%). Each component – pitch accent, **phrase accent** and boundary tone – contribute to a distinct type of information to the overall interpretation of the

pattern. Pitch accents convey information on the status of individual referents, and phrase accents convey information as to the degree of relatedness of one intermediate phrase to the surrounding ones. Boundary tones convey information about relationships among intonational phrases – whether a phrase is to be interpreted either with respect to a succeeding phrase or not. In addition, a number of automatic phonetic implementation rules also apply that allow the complete phonetic shape of the contour to be recreated. Two of the most significant are an **upstep rule** which raises an L boundary tone after an H phrase accent and a **catethesis rule** which causes a gradual declination of pitch across a phrase. However, unlike Brazil's conception of a high, initial key to mark larger, pitch sequence units, there is no discussion of a phrase initial, left edge boundary tone.

The meaning of the intonation contour is derived from the particular sequence of pitch accents, phrase accents and boundary tones that occur, and many of the tonal combinations that are identified by Pierrehumbert and Hirschberg and the values attached to them bear comparison to Brazil's interpretations. For example, the following contour – an H* pitch accent followed by an L phrase accent and an L% boundary tone – is said to 'convey new information' in much the same way that Brazil's proclaiming, falling tone adds a new variable to the background (Pierrehumbert and Hirschberg 1990: 272):

Legumes are a good source of vitamins
H* L L%

If the L phrase accent were followed by a high boundary tone (H%), the contour would be essentially equivalent to a mid-termination, referring tone in Brazil's model which carries a pragmatic meaning synonymous with Pierrehumbert and Hirschberg's gloss of 'when S believes that H is already aware of the information, if S wishes to convey that it is mutually believed' (1990: 290). Thus, both models, while varying substantially in the theoretical constructs that they employ, share a similar conception of the function of intonation in discourse, i.e. that the speaker is focused on fitting their message into their understanding of the current beliefs of the hearer and the weight of subsequent utterances.

Both models of discourse intonation are in use in varying degrees in research and pedagogy and have sophisticated transcription systems. The system associated with the AM model is known as **ToBI** (Tone and Break Indices.) Both frameworks have been applied cross-linguistically and to the analysis of non-native speaker discourse. They have also been used to transcribe corpora of read and spontaneous speech. It remains to be seen if one will ultimately prove to be more explanatory in these diverse applications than the other.

L. P.

Suggestions for further reading

Brazil, D. (1997) *The Communicative Value of Intonation in English*, 2nd edn, Cambridge: Cambridge University Press.

Ladd, D.R. (1996) *Intonational Phonology*, Cambridge: Cambridge University Press.

Pierrehumbert, J. and Hirschberg, J. (1990) 'The Meaning of Intonational Contours in the Interpretation of Discourse', in P.R. Cohen, J. Morgan and M.E. Pollack (eds), *Intentions in Communication*, Cambridge, Mass.: MIT Press.

Tench, P. (1996) *The Intonation Systems of English*, London: Cassell.

Wennerstrom, A. (2001) *The Music of Everyday Speech*, Oxford and London: Oxford University Press.

L

Language acquisition

Introduction

Language acquisition is the term commonly used to describe the process whereby children become speakers of their native language (first-language acquisition) or children or adults become speakers of a second language (second-language acquisition).

Early studies of child development such as that of the German biologist Tiedemann (1787), Charles Darwin (1877) and Hippolyte Taine (1877) included observations about the development of language. The first detailed study of child language was, according to Campbell and Wales (1970), that of the German physiologist Preyer (1882), who kept a diary of the first three years of his son's development (Campbell and Wales 1970: 243). He also makes notes on many aspects of development in addition to the linguistic, including motor development and musical awareness. The first published book to be devoted to the study of a child's language alone was C. and W. Stern's *Die Kindersprache* (1907) (not available in English), and it is from this work that the notion of **stages** of language acquisition (see below) derives (Ingram 1989: 8–9). The diarists' main aim was to describe the child's language and other development, although some explanatory hypotheses were also drawn. These typically emphasised the child's 'genius' (Taine 1877), an inbuilt language faculty which, according to Taine, enabled the child to adapt to the language which others presented it with, and which would, had no language been available already, have enabled a child to create one (Taine 1877: 258). At the time the preferred method of data collection was the **parental diary** in which a linguist or psychologist would record their own child's development. Ingram (1989: 7) identifies a **period of diary studies (1876–1926)**.

With the rising popularity of behaviourist psychology [*see also* BEHAVIOURIST LINGUISTICS] after the First World War, **longitudinal** studies of individual children – studies charting the development of one child over a long period – came to be regarded as insufficient to establish what 'normal behaviour' amounted to. Different diaries described children at different intervals and concentrated on different features of the children's behaviour, so that it was impossible to draw clear comparisons between subjects. Instead, **large-sample studies** were favoured, studies of large numbers of children all of the same age, being observed for the same length of time engaged in the same kind of behaviour. Several such studies, concentrating on several age groups, would provide evidence of what was normal behaviour at each particular age, and the results of the studies were carefully quantified. Environmental factors were carefully controlled, as behaviourism only took as scientifically valid statements about the influence of the environment on the child's development: hence, all the children in a given study would come from similar socio-economic backgrounds, and each study would use the same numbers of boys and girls.

Ingram (1989: 11ff.) pinpoints the **period of large-sample studies** to 1926–57, the period beginning with M. Smith's (1926) study and ending with Templin's (1957) study. Studies carried out during this period concentrated mainly on vocabulary growth, mean sentence length, and pronunciation. **Mean sentence length** (Nice

1925) was calculated by counting the number of words in each sentence a child produced and averaging them out. The results for these three areas for what was perceived as normal children (Smith 1926; McCarthy 1930; Wellman et al. 1931) were compared with those for twins (Day 1932; Davis 1937), gifted children (Fisher 1934), and lower-class children (Young 1941).

The publication of Templin's study, the largest of the period, took place in the year which also saw the publication of Noam Chomsky's *Syntactic Structures* (1957; *see* GENERATIVE GRAMMAR), which heralded the end of the reliance on pure empiricism and behaviourist psychology in linguistic studies [*see* BEHAVIOURIST LINGUISTICS]. Chomsky's work and that of his followers highlighted the rule-governed nature of language, and a major focus of attention of many linguists working on language acquisition since then has been the acquisition of morphosyntactic rules, an aspect neglected in earlier large-sample studies. With this aim, **longitudinal language sampling** in the period from 1957 onwards controlled more carefully the selection of subjects, the research design and the criteria for measurement, aspects which still inform studies of language acquisition. In typical studies of this kind (Braine 1963; Miller and Ervin 1964; Bloom 1970; Brown 1973), at least three separate, carefully selected children – ones which are talkative and just beginning to use multiword utterances – are visited and recorded at regular intervals by the researcher(s). Braine (1963) supplemented this methodology with diaries kept by the children's parents.

Since the 1980s naturalistic data have been complemented by **experimental data** of different types: elicited production, judgements on syntax, morphology, semantics and phonology, as well as comprehension tests, which are designed in ways appropriate to the child's age. In act-out tests, for example, either the child moves toys or reacts to the scene presented. The use of computers has made it possible to analyse large corpora and, thus, to test hypotheses based on larger databases than before.

Relation between child and adult competence

The study of child-language acquisition can provide not only insights into the child's progression towards the adult system but also evidence for or against theories of adult language. It is therefore important to examine carefully the relation between the child and the adult system.

Children do not normally begin to produce words until they are a year old, a period which Ingram (1989: 83ff) calls **prelinguistic development**. It is crucial to study this period as part of a theory of child-language acquisition in order to establish which links, if any, there are between this and later stages.

Under normal circumstances every child will acquire language within a short time. This process is inevitable and independent of intelligence or cognitive development. This has led Chomsky (1975a, 1981, 1986b) to the assumption that there is an innate ability to learn a language which is domain-specific, i.e. specific for learning a language. This ability guides infants in the analysis of linguistic input. Notice that, although cues are available in the input, children have to be able to discover what constitutes a cue in a given language. Children achieve linguistic knowledge that allows them to produce and interpret an infinite number of sentences, in spite of having been exposed to a finite set of linguistic data. These data consist of positive evidence, i.e. acceptable sentences in their mother tongue; they are not told, on the other hand, which interpretations or which sentences are not possible. This is what is known as the argument of the **poverty of the stimulus**.

In the generative framework it is assumed that we have a mental grammar which establishes what is possible or not possible in languages, both in terms of forms and in terms of the meaning assigned to them. This grammar incorporates principles which hold across languages (i.e. universally), and which do not have to be learnt. These principles determine the properties that make languages similar. On the other hand, language-specific properties are encoded in parameters with a very limited set of options. An example is the parameter which rules the phonological realisation of the subject (null-subject parameter): children exposed to Chinese will set this parameter to the positive value (i.e., the subject may not be realised overtly), while those exposed to English will set it to the negative value (i.e., the subject must be realised overtly).

There are different views about how the adult and the child system compare and about the extent to which the child's system needs to be changed or restructured and basically three answers can be given:

1. The child's system is radically different from the adult one (e.g., Bickerton 1990). Within this **discontinuity view** the initial system has no proper linguistic characteristics: it consists of strings of words, which might also in principle be produced by trained chimpanzees. That is, principles of **universal grammar** have not yet emerged and children's grammars may fall outside the borders of possible natural languages.
2. Within a **continuity approach**, on the other hand, the child's system is basically identical to the adult one and differences are taken not to relate to the system as such, but to phonetic or pragmatic underspecification: for example, time reference is not properly established and this leads to the occasional omission of tense markers (Weissenborn 1990; Hyams 1992, 1994, 1996; Poeppel and Wexler 1993).
3. In a weaker version of the continuity hypothesis, principles of Universal Grammar are available for the child at the onset of the acquisition process and they guarantee that child grammars will fall within the borders of a natural language. The child's system, however, may deviate from the adult one: it may represent a subset of the adult system or be underspecified with respect to it. **Structure-building approaches** (e.g., Lebeaux 1988; Clahsen 1990; Radford 1990; Guilfoyle and Noonan 1992; Clahsen et al. 1993/1994, among others) identify delays in the development of those heads which carry syntactic information such as agreement or tense, i.e. **functional heads**.

A central question for discontinuity and weak continuity approaches is what brings about the change to the adult system. Given the assumption of an innate linguistic system, an obvious answer points to biological maturation as the cause of the change (Borer and Wexler 1987). According to the **maturational theory of language acquisition**, principles of universal grammar are genetically programmed to become operational at different, determined stages. This bears similarities with human development in other aspects. It also accounts plausibly for the similar path of development for different individuals. On the other hand, if acquisition was solely based on biological maturation, one would expect that children exposed to more than one language from birth would develop their languages at the same pace, which is not always the case (Schlyter 1995).

An approach which takes into account properties of the input, such as the **lexical learning approach** (Pinker 1984, 1989; Clahsen 1990) seems to fare better in this respect. According to these researchers, grammar acquisition is driven by the learning of lexical items with their specifications, say, as mass noun or transitive verb with an agentive subject. For example, the lexical entry for 'give' will specify three arguments, i.e. agent, theme and goal, realised as subject, direct and indirect object, respectively. This is an example of how children's relation to the input is explored in a rationalist framework.

Empiricist approaches, on the other hand, try to explain language acquisition without resorting to abstract linguistic knowledge. In Bates and MacWhinney's (1989) **functionalism and competition model** language acquisition is based on inductive learning, 'guided by form-function correlations' (Bates and MacWhinney 1989: 26), where the forms are guided by communicative functions. The source of knowledge is assumed to lie in the input (and not in the mind). Language acquisition is, thus, a perceptual and not a cognitive problem (Bates and MacWhinney 1989: 31).

Connectionist approaches vary greatly, crucially in whether they assume that brain circuits are able to support the representation of symbols and rules or not. Common to all of them is the notion of learning by association (see, for example, Elman et al. 1996; Rohde and Plaut 1999).

The acquisition of English past tense has often been used to model acquisition. The acquisitional process is conceived as an association of the phonetic properties of verb stems and those of the past tense, which are then generalised to similar-sounding words (Rumelhart and McClelland 1986). Connectionist models simulate this

process; they make the overextension errors children make, e.g., 'go' – 'goed'. The modelling has mainly dealt with morphology and far less with syntax; although some word sequencing has been modelled, it is not clear if these models can learn complex syntactic phenomena. A limitation of connectionist models is, according to Bickerton (1996) and Guasti (2002), the impossibility to learn from degenerate input. Deaf children of hearing parents receive limited linguistic input, in spite of which they acquire a refined sign language. Similarly, the complex structure of creole languages has been developed by children exposed to the more rudimentary structure of pidgins [*see* CREOLES AND PIDGINS]. This indicates that there is linguistic knowledge that cannot be acquired just by analogy.

A further alternative to a rationalist approach to language acquisition is **item-by-item learning based on imitation of the input** (Tomasello 2000a, 2000b). Tomasello contradicts the strong continuity view that infants have full linguistic competence at birth by a **usage-based theory of language acquisition**. In order to be able to produce and understand an infinite number of sentences, human beings have to be able to segment words and assign them to discrete syntactic categories, such as noun, verb, etc. In the rationalist paradigm it is assumed that these categories are part of a body of innate knowledge. The empiricist claim, on the contrary, is that children compute distributional information to identify syntactic categories. Simple learning procedures can lead to acquisition of syntactic structures. According to this approach early syntactic creativity can be accounted for by schemas and a reduced number of simple operations to modify them, such as substituting a word into a previous utterance or schema. MacWhinney's (2001) **emergentist theory** views various **learning mechanisms** such as indirect negative evidence, cue construction, monitoring, competition and conservatism as emergent from the basic item-based structure. Some syntactic structures are more difficult to learn than others, which points to areas of grammatical competition and, consequently, of processing load. As Lust (2006: 68) points out, empiricist approaches still need to make more explicit what the cognitive and socio-cognitive mechanisms are which allow children to generalise from an individual item to a pattern, and also how children determine similarities across constructions in order to form the generalisation, if no linguistic analysis is involved.

The overall question is, as Lust (2006: 70) puts it, not so much if there is a linguistically specific and innate ability for language acquisition, but what its precise nature is and how it works. Similarly, the issue is not so much if there is any learning involved in language acquisition, but what exactly it is and how it works.

Sound perception and production

Sound perception

While most parts of an infant's body need to grow and develop during its childhood, the inner ear is fully formed and fully grown at birth, and it is thought that infants in the womb are able to hear. Experiments have been devised using the **non-nutritive sucking technique** in which an infant is given a device to suck which measures the rate of sucking; a sound is played to the infant until the sucking rate stabilises; the sound is changed; if the infant notices the sound change, the sucking rate will alter. Such experiments have shown that from the first days of life (two to four days) infants are able to distinguish between the native and a foreign language (Mehler et al. 1988; Moon et al. 1993; Bosch and Sebastián-Gallés 1997). Mehler et al. (1988) show that four-day-old infants born in a French-speaking environment distinguish between Italian and English utterances, and given that infants are unlikely to have any lexical knowledge, they must be relying on phonological information. The studies mentioned above show that prosodic information is crucial. Mehler et al. (1996) claim that the different rhythms specific to different languages guide infants in the discrimination.

Infants also need to learn the repertoire of sounds or phonemic categories valid in their native language. Research from the 1970s on has shown that at one month, infants are able to distinguish voiced from unvoiced sound segments (Eimas et al. 1971), and by seven weeks they can distinguish intonation contours and places of articulation (Morse 1972; Clark and Clark 1977: 376–7). They also show perceptual

constancy: they focus on a vowel or consonant and disregard incidental variation (Vihman 1996: 71). In the first six months of life infants can accommodate to any language-specific selection from the universal set of phonetic categories. Changes towards the native language can be observed in the second half of the first year: at twelve months infants can only handle sounds which have a meaning, or phonemic value, in their native language. This loss of sensitivity is part of a functional reorganisation which allows infants to learn words, in that it reduces the search space. It is also a further indication that human infants are tuned in to human language from very early on in life.

Sound production

The only sounds a newborn baby makes, apart from possible sneezes, coughs, etc., are crying sounds. By three months old, the child will have added to these **cooing** sounds, composed of velar consonants and high vowels, while by six months, **babbling** sounds, composed of repeated syllables (*bababa*, *dadada*, *mamama*, etc.) have usually appeared. Vihman (1996: 118) observes that 'regressions' to apparently 'earlier' forms are observed together with changes in the child's capacity for sound production. So, for example, 'grunts' occur shortly before the emergence of reduplicated babbling as well as shortly before the use of words. Evidence for the influence of the language of the environment has been observed at around eight months for prosodic features and around ten months for vowels and consonants. These findings suggest that a link between perceptual and articulatory processes develops in the second half of the first year (Vihman 1996: 119).

The changes in the child's vocalisations during the first year of its life are connected with gradual physiological changes in the child's speech apparatus, which does not begin to resemble its adult shape until the child is around six months old. Until then, the child's vocal tract resembles that of an adult chimpanzee (Lieberman 1975): the larynx is higher than in adults, the throat smaller, the oral cavity flatter and the tongue has a different shape. However, it should be noted that the maturation of the speech apparatus may not be the only reason for the delay of language production: Guasti (2002: 47) observes that manual babbling in deaf infants coincides with the onset of vocal babbling in hearing ones.

Deictic gestures and '**protowords**' stand at the start of intentional communication. Protowords are relatively stable vocal forms with a consistent meaning that is specific to an individual child. Early words are used at the same time as gestures, grunts and protowords (Vihman 1996: 147).

Opinions vary about whether there is a connection between the babbling stage and the later acquisition of the adult sound system. According to the continuity approach, the babbling sounds are direct precursors of speech sounds proper, while according to the discontinuity approach there is no such direct relation (Clark and Clark 1977: 389). According to Jakobson (1968), there are two distinct sound production stages: the first is the babbling stage, during which the child makes a wide range of sounds which do not appear in any particular order and which do not, therefore, seem related to the child's subsequent development; during the second stage many of the sounds present in the first stage disappear either temporarily or permanently while the child is mastering the particular sound contrasts which are significant in the language it is acquiring. The problems with this approach are, first, that many children continue to babble for several months after the onset of speech (Menn 1976); second, many of the sound sequences of later words seem to be preferred during the babbling stage – as if being rehearsed, perhaps (Oller et al. 1976); finally, babbling seems often to carry intonation patterns of later speech, so that there seems to be continuity at least at the suprasegmental level (Halliday 1975; Menn 1976). Mowrer (1960) has argued in favour of the continuity hypothesis that babbling contains all the sounds found in all human languages, but that this sound repertoire is narrowed down to just those sounds present in the language the child is to acquire. Careful observation, however, shows that many sounds found in human languages are not found in babbling and that some of the sounds that are found in babbling are those which a child may have problems with when it starts to speak the adult language.

Clark and Clark (1977: 390–1) believe that babbling could be a necessary preliminary

exercise to gain control over articulation in the mouth and vocal tract. They add, however, that if this was the only function of babbling, 'there would be little reason to expect any connection between the sounds produced in babbling and those produced later on'. Some discontinuity is observed in that some phonetic segments are only mastered when children start using words; but this type of discontinuity is clearly not fundamental.

Acquisition of the lexicon

The child's task of vocabulary learning entails more than just storing a list of words. The mental lexicon is an active store in which lexical items are collected and organised. Many lexicon models assume that not only words are stored but also inflectional material. Processing data, e.g., errors, indicate how lexical items are stored and processed. Different types of information have to be stored with a lexical item and constitute the lexical entry. The following count among the central ones:

1. the **semantic representation**: if we use 'cat' as an example, the semantic representation will include +concrete, +animate, subgroup of 'animal';
2. the **lexical category or word class**: noun;
3. **syntactic properties**, e.g., gender in languages which mark it;
4. **morphological properties and internal structure**, e.g., non-compound, regular plural;
5. the **phonetic-phonological form**, e.g., /kæt/, number of syllables, word stress.

The child has to identify this information and store it in a lexical entry. When the child acquires a word, they must grasp complex information and establish relations among new pieces of information and those already existing. The existing structure of the lexicon has an influence on the way new lexical items are stored; on the other hand the acquisition of new lexical items triggers a reorganisation of the established links in the lexicon. Under this perspective it seems plausible to assume that the child's lexicon is not only smaller than the adult one but also organised in a different way.

The first fifty words

The first words occur at the age of ten to eighteen months. In the course of several months the child acquires a vocabulary of thirty to fifty words. At this stage the lexicon grows slowly, at a rate of two or three words a week.

The form and the function of the first words differ from those of the adult language. With respect to form, the first words are usually phonologically simplified.

According to Clark (1993: 33) some of the first ten to twenty words children produce only occur in certain contexts: a child might say *car* only when seeing a car from the window but not in the presence of toy cars or cars in other settings. However, not all words are context bound, in fact, most early words are used appropriately in a variety of contexts. They refer to objects (e.g., car), individuals (e.g., teddy) or situations.

After the child has acquired the first fifty words and towards the end of the second year of age, new words are added to the existing vocabulary at a very fast pace (**the vocabulary spurt**); several new words occur daily. For instance, Smith's (1926) subjects' average productive vocabulary was twenty-two words at eighteen months, 118 words at twenty-one months, and 272 words at two years. According to Clark (1993) the vocabulary size of a two year old varies between fifty and 500 words in production. The vocabulary a child is able to understand is considerably larger.

Children adhere to what Clark (1993) calls the **principle of conventionality** in assuming that target words are those given by the speakers around them and in general do not make up sound strings and assign them their own meaning. Children also appear to assume that each word form has a meaning different from that of other words and might avoid uses that overlap in meaning (e.g., 'the dog is my pet').

Some of the early words may be **undergeneralised** (or **underextended**), i.e. they refer to a subset of a class for example to only one type of dog. In other cases they may be **overgeneralised** (or **overextended**) and apply to the members of the adult class as well as to perceptually similar members of different classes. An example of overgeneralisation would be the use of the term *dog* for all walking

animals, dogs, cats and even birds on the ground. This seems to be a communicative strategy at a stage when the vocabulary is limited. Support for this view comes from observed discrepancies between production and comprehension (Clark 1993:33 ff.): a child may be able to pick out the appropriate object in response to *motorcycle*, *bike*, *truck*, *plane*, but refer to them all as *car* in production (Rescorla 1980: 230).

Grammatical word classes and boot-strapping hypotheses

The problem of identifying word classes in child language as well as the question of how children identify word classes has been subject of debate ever since the publication of Brown (1973). Recurrent ideas are that children start by developing their grasp of semantic relations and that syntax can only develop once these are in place. Pinker's (1984) **semantic boot-strapping hypothesis** is a version of this view: children determine word classes on a semantic basis. Their semantic knowledge leads them then to discover the word classes associated with the semantic categories, even if there is no one-to-one correspondence between them. The **syntactic boot-strapping hypothesis** (Gleitman 1990), on the other hand, claims that syntactic information, for example the argument structure of a verb, can be used to derive the meaning of a word. This approach refers to a stage in which word classes are already acquired, whereas according to the semantic boot-strapping hypothesis the child uses semantic information in order to identify word classes. As Rothweiler and Meibauer (1999: 15) point out, a problem for the semantic boot-strapping hypothesis is the fact that words can only be recognised in a sentence as members of different classes, and only then is it possible for children to see a link between word classes and semantic categories (cf. Behrens 1999).

Lexical representation and inflectional elements

For a long time, studies on the acquisition of inflectional elements focused on the relation between morphological markings and syntactic representation, e.g., in subject–verb agreement. More recently, attention is also paid to the lexical representation of inflectional elements and their acquisition. The status of regular and irregular inflection plays a central role here, as different approaches predict a different acquisitional course. It has been observed that children overgeneralise morphological markings, e.g., 'goed' for 'went'. In a **connectionist approach** (e.g., Rumelhart and McClelland 1986), no differences between regular and irregular morphology are assumed and both are represented in an associative network. Accordingly, there will be no difference in the way regular and irregular morphology are acquired; the observed overgeneralisations are claimed to follow from frequency of occurrence in the input. A **dual-mechanism approach** (Pinker and Prince 1992), on the other hand, assumes that regular morphology is driven by rules based on symbolic representations while irregular morphology is based on idiosyncratic lexical information. Regular morphology is used when no other information is available. As children in early acquisitional stages cannot resort to many stored forms they overextend regular forms (Rothweiler and Meibauer 1999: 24).

The development of syntax

The period between twelve and sixteen months, during which children normally begin to comprehend words and produce single-unit utterances, is usually referred to as the **one-word** stage. By the time the child's vocabulary has grown to around fifty words they enter the so-called **two-word stage**. At the beginning of this stage children typically produce strings like *Eve gone* (Eve, one year six months, from Brown 1973), which lack grammatical inflections and function words; this kind of language is known as **telegraphic speech** (Brown and Fraser 1963). Even if children are presented with full sentences to imitate, they tend to repeat the sentences in telegraphic form. However, it is obvious that the child's system is more complex than simple strings of words and that it can be interpreted as the beginning of phrase structure.

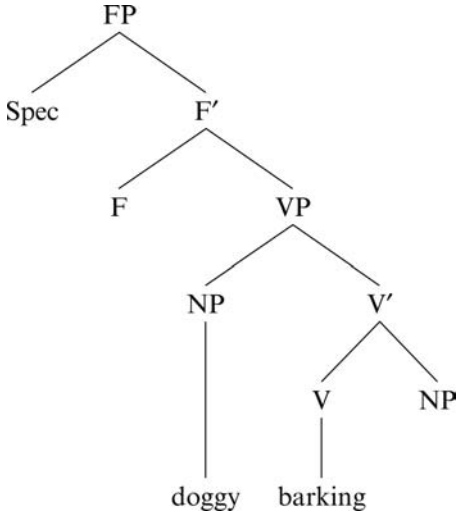
Braine (1963) observed a tendency for some words in children's utterances to be placed either at the beginning or at the end of the utterance. He calls these words **pivots**, as opposed to

open-class words. Braine claims that the child will notice that certain open-class words always come after a pivot, while other open-class words always come before a pivot, and that this information allows the child to begin to distinguish different word classes among the open-class words. However, while the observation about word-order regularities still holds, the analysis is no longer considered valid. More recently, Radford (1990) calls the one-word period the '**acategorial stage**', given that it is not always obvious which category the words produced by the child should be assigned to. In the two-word stage, on the other hand, syntactic categories such as nouns and verbs are used by the child in a systematic way. Verbs are used to predicate something of the nouns, as in the following examples (from Radford 1996: 44): 'baby talking' (Hayley, one year eight months), 'daddy gone' (Paula, one year six months). At this stage children do not use finite verbs (examples from Radford 1996: 54):

- the third person marking *-s* is missing in the relevant contexts: 'Paula play with ball' (Paula, one year six months);
- auxiliaries are missing: 'baby talking' (Hayley, one year eight months), 'Daddy gone' (Paula, one year six months)
- infinitival *to* is missing: 'want go out' (Daniel, one year ten months).

The generalisation in the clause domain is that children's utterances at this stage contain projections of the lexical category 'verb' (V) but not of the categories which carry syntactic information (functional categories) associated with it such as AGR(eement) or T(ense). The lexical categories, 'noun' (N), 'adjective' (A) and 'preposition' (P), are attested as well, but, as in the verbal domain, no syntactic information associated with them, for example number for nouns.

The following is an X-bar representation of sentence structure [*see* GENERATIVE GRAMMAR], where V(erb)P(hrase) is a projection of the lexical category V and F(initeness)P(hrase) a projection of a functional category, i.e. a projection carrying syntactic information. 'Finiteness' is used here as a generic label; it is used as an example of a functional category without further specifying which one (e.g., AGReement, Tense). Under the assumption that child utterances consist only of projections of lexical categories we expect to find lexical material which can be accommodated within the domain of a VP (Radford 1990, among others). In an underspecification approach (e.g., Clahsen 1990, 1993/1994; Hyams 1996) one or more functional projections are available but not fully specified as in the steady state.



Within the domain of the clause, question and negative formation have been carefully studied. At the earliest stage children form negatives simply by beginning the utterance with *no* or *not*, in a way that suggests that these words are external to the sentence. This is followed by a stage in which *don't* and *can't* begin to appear, and both these forms and *no* and *not* are placed in front of the verb instead of at the beginning of the utterance. The explanation for this acquisitional pattern is that in early utterances negation is either adjoined to VP or heads the underspecified functional projection. At a later stage, as projections for finite elements develop, finite verbs will occupy the head of the finite projection leaving the negation behind, as in *didn't* and *won't*.

Early questions are typically marked just by rising intonation: 'Fraser water?' (from Klima and Bellugi 1966: 200) is an example of a yes–no question, 'Daddy go?' ('where does Daddy go?' from Radford 1990: 123) an example of a wh-question. Auxiliaries or modals are not attested at this stage and nor are wh-words. When children

start using wh-words the inventory is limited and includes mainly *where*, *who*, *what:* 'where helicopter?' (Stefan, one year five months, from Radford 1990: 125). These *wh-* words can be followed by *-s*, which can be interpreted as a cliticised realisation of the copula: 'where's helicopter?' (Stefan, one year five months, from Radford 1990: 125, see also Klima and Bellugi 1966: 201). These questions are initially formulaic. Evidence for this claim comes from (missing) agreement facts: 'what's these?' (Adam, two years two months, from Radford 1990: 126).

Some authors (Klima and Bellugi 1966; Radford 1990) observe that children fail to understand *wh-* questions which include movement (from a position in the IP into the Spec(ifier)-C). An example is the following exchange (Klima and Bellugi 1966: 202):

Adult: what are you doing?
Child: no

This is taken as an indication that at this stage the projection which should host the moved element has not been developed in the child's system, and the sentence cannot be parsed by the child.

In the nominal domain, nouns and adjectives occur but not deteminers such as articles and possessives. Demonstratives occur on their own, but not together with a noun. This resembles the picture we observe in the verbal domain, in that elements carrying syntactic information are absent from early utterances.

The development of morphology

Children normally begin to acquire grammatical morphemes at the age of around two years. Studies of the acquisition of grammatical morphemes go back to Berko (1958), who studied the acquisition by English-speaking children of plural *-s*, possessive *-s*, present tense *-s*, past-tense *-ed*, progressive *-ing*, agentive *-er*, comparative *-er* and *-est*, and compounds. Berko worked with children aged between four and seven years old, and she showed that five- and six-year-old children were able to add the appropriate grammatical suffixes to invented words when the words' grammatical class was clear from the context. Her experimental procedure has become known as the **wug procedure**, *wug* being one of the invented words used in the experiment.

This experiment and others like it may be used to argue for the hypothesis that children are 'tuned in', not only to the sounds of human language (see above) but also to its syntax, in the sense that they display 'a strong tendency … to analyse the formal aspects of the linguistic input' (Karmiloff-Smith 1987: 369).

The order in which morphemes are acquired has been studied for different languages (see for example Brown 1973 and many others). The order of acquisition of grammatical morphemes in English tends to be that *-ing* appears first, then the regular plural *-s;* irregular past-tense forms are attested before the regular forms. The order observed is compatible with the assumptions of the structure-building approach to language acquisition (Radford 1990; Guilfoyle and Noonan 1992, among others) since the presence of *-ing* before third person *-s* or any past-tense form would indicate that inflectional material associated with the functional categories AGReeement and Tense are attested later.

The acquisition of the core grammar is finished very early, within the first three or four years of age. The process of acquisition of other domains of language (e.g., expanding the vocabulary; subtleties of use of tenses and moods in the languages which have them; rules of discourse) takes several years or goes on through an individual's life.

The assumption of a critical period

The biological notion of maturation leads to the assumption of a critical period for language acquisition, originally proposed by Lenneberg (1967) for first-language acquisition. Based on hemispheric lateralisation as an explanation Lenneberg characterised the period between the ages of six and thirteen as the critical period within which the acquisition of the first language should be activated.

Evidence for a critical period is found in cases of children deprived of exposure to language at a young age, such as Genie (Curtiss 1977), who was confined in a room until the age of thirteen, with little or no language experience during that time. She was later able to develop lexical

knowledge but retained complex structural deficits. Cases such as this one may be confounded by other types of deprivation involved.

Further evidence for a critical period comes from learners of a second language (L2).

Second-language acquisition

It is striking that while everyone succeeds in becoming a competent speaker of their first language, this level of competence is usually not achieved by a second-language speaker. What a critical period for L2 acquisition means is subject of much debate. Research since around 2000 has been comparing child and adult learners of a second language, asking if children are better than adults (see e.g., Hylstenstam and Abrahamsson 2003). Results so far indicate that syntax becomes more difficult to master with increasing age, but mastery of morphology remains out of reach for many. Lardiere (2000) reports the case of Patty, a speaker of Chinese, who after nearly twenty years living in an English-speaking environment frequently omitted morphology, for example, markers for past tense, whereas Patty's use of obligatory subjects and the distribution of verbs with respect to negation suggests a more advanced knowledge of syntax (Lardiere 2000).

Although there is anecdotal evidence of second-language learners who pass for natives in conversation, when analysed with linguistic tools, these learners differ from native speakers. Some researchers argue that these differences in achievement in first- and second-language acquisition indicate that the specific ability to learn a language is not available beyond puberty; otherwise adult learners would reach native-like proficiency in the second language (Bley-Vroman 1989; Schachter 1990). The different developmental paths observed in first- and second-language acquisition is taken to be a further argument for the non-availability of the innate knowledge that universal grammar (UG) represents (Meisel 1991). Others (e.g., White 1989; Schwartz and Sprouse 1994) argue that UG remains available after puberty and throughout an individual's life. The latter claim is based on the observation that **interlanguages**, i.e. L2 grammars at different developmental stages, have the structure of natural languages, as opposed to being just formulas or strings organised only by pragmatic needs.

The role of the first language (L1) in the acquisition of the second has been discussed for decades, ever since Lado's (1957) claim that what is similar in L1 and L2 will be easily acquired and what is different will cause difficulties. Although this claim was soon disproved, it is clear that the L1 plays an important role in learning an L2. The debate focuses on its precise role. Do learners face the L2 as children acquiring the L1? In this case one expects to see little influence of the learners' L1 (Klein and Perdue 1992; Epstein et al. 1996). Do learners use lexical material from the L2 while relying on the structure and specifications of their L1? In this case strong transfer effects should be evident (Schwartz and Sprouse 1994). It has been observed, for example, that speakers of languages which do not have articles, such as Chinese or Korean, omit them when they start learning a language that has them, such as English or German. But longitudinal studies have also shown that these speakers are able to learn to use articles, in other words, the transfer effects can be overcome (Robertson 2000; Parodi et al. 2004).

As mentioned above, not all aspects of a second language are equally easy to master. Morphology in an L2 seems to pose particular difficulties for adult learners and subtleties of syntax may remain elusive even for very proficient learners.

This account of how children learn the language of their speech community and how this process compares to second-language acquisition has, of necessity, been limited in many ways, and the reader is encouraged to consult Goodluck (1991), Guasti (2002), Lust (2006), Ellis (1994) and White (2003) for a very thorough account of all of the issues and data involved.

T. P.

Suggestions for further reading

Ellis, R. (2008) *The Study of Second Language Acquisition*, Oxford: Oxford University Press, First edition 1994.

Goodluck, H. (1991) *Language Acquisition*, Oxford: Blackwell.

Guasti, M.T. (2002) *Language Acquisition: The Growth of Grammar*, Cambridge, Mass.: MIT Press.

Lust, B. (2006) *Child Language: Acquisition and Growth*, Cambridge: Cambridge University Press.
White, L. (2003) *Second Language Acquisition and Universal Grammar*, Cambridge: Cambridge University Press.

Language and advertising

Advertising is of substantial interest to linguistics for a number of reasons:

- The need to create brief, striking, and persuasive messages leads to uses of language which are crafted, compressed, rich in imagery, innovative and playful, making advertising language of interest to stylistics, poetics and the study of linguistic creativity.
- Advertising interweaves linguistic with other modes of communication such as pictures and music, and has been at the forefront of using language with new communication technologies as they appear (photograph, film, television, internet, mobile phones), making it of interest to the study of multimodal communication.
- Advertising provides a major example of contemporary persuasive language, whose tone and techniques have permeated and colonised other genres of persuasion, and is thus of interest to the study of contemporary rhetoric (McQuarrie and Mick 1996; Smith 2006).
- As a genre which is often on the periphery of attention, and processed in different ways from other genres by those who have acquired 'advertising literacy' (Goodyear 1991), the study of advertising may inform both psycholinguistics and genre theory.
- As a major force in capitalist economies, influencing and reflecting the values and identities which are current within them (in such matters as sexuality, gender roles, life stages, the family, 'success') advertising is a magnet for critical discourse analysts interested in the relations between language use, power and ideology.
- As a discourse whose tokens are distributed globally, seeking sometimes universal and sometimes local appeal, advertising reflects changes in the relations of languages and cultures. It has contributed to the spread of English as an international language, and to globalisation generally.

Almost any example can be viewed from any or all of these dimensions. For example, a magazine advertisement for Sky television channels used four frames across the bottom of two adjacent pages. Each of the first three frames shows a picture with words written across it as follows:

> *from chasing trophies* (across a picture of top footballer Wayne Rooney)
> *and chasing answers* (across a picture of a character in the drama series *Lost*)
> *to chasing number ones* (across a picture of singer Kylie Minogue)

The final frame gives details of the cost of the service and how to subscribe, and at the bottom the words

> *SKY*
> *believe in better*

This ad could be analysed for the following:

- Its use of poetic phonological, lexical and grammatical parallelism, and deviation from grammatical norms. The three lines 'from chasing trophies / and chasing answers / to chasing number ones' are rhythmic. They repeat the same word (*chasing*), and the same structure (a preposition or conjunction followed by a noun clause composed of non-finite verb plus direct object). The phrase *believe in better* is alliterative, has the same rhythm as *from chasing trophies*, and deviates from grammatical norms by making the object of *believe in* a comparative adjective (*better*) rather than a noun.
- Its uses of layout, images and varying fonts, and the way it relates linguistic units to pictorial ones. Each of the first three frames has one of the parallel structures (as described above) written across it. In the bottom centre of each frame is the name of a Sky Channel with a further noun phrase underneath it.
- Its relation to technologies. It is in print but about digital TV, phone and internet

connections. The three pictures are like changing images on a TV screen as a viewer moves from channel to channel.
- Its use of a classical rhetorical triplet (Balliet 1965): the first three frames and phrases set up a pattern which is broken in the fourth frame.
- The way in which it leads the reader across two pages and culminates in a frame which effectively highlights, through varied positions and fonts, the different kinds of information the purchaser will need.
- The power relations which it represents and embodies: its promotion of a global corporation; its use of celebrity images from sport, drama and music; the way in which it fulfils its legal obligation to carry detailed information about subscriptions by relegating it to very small print below the main body of the ad.
- The degree to which its language and images are specific to one location (this is from a British newspaper) or appropriate internationally.

Analysis of an advertisement may focus upon one or more of these aspects. The richest descriptions, however, will seek to see how these different aspects interact and condition each other, analysing for example how linguistic detail determines or is determined by other modes of communication, the channel, the rhetorical strategy, or the power relations depicted or implied.

Such generalisations about the features of advertisements, and illustration of them from one example, belie the fact that advertising as a genre is both difficult to define and takes many different forms. Ads vary by product (durables versus fast-moving consumer goods), mode (speech, writing, song), medium (print, poster, TV, internet, etc.), target audience (women, men, teenagers, etc.) and scale (small/personal ad versus big ad). They can also be classified in terms of technique, using terms such as 'hard' and 'soft' sell (Ogilvy 1985), 'reason' and 'tickle' (Bernstein 1974; Simpson 2001), 'sudden burst' and 'slow drip' (Brierley 1995: 116). All of these dimensions may influence the kind of language used and the ways in which it is understood. Simple dictionary definitions of advertising such as 'the promotion of goods and services for sale' (*Collins Concise Dictionary Plus*) disguise both this variety, and also the radical expansion of advertising and consequent change in its character in the twentieth century (Williams 1960; McLuhan 1964), especially following the advent of commercial TV from the 1950s onwards, making contemporary advertisements very different in character from simple sales pitches in earlier eras. Advertising in the contemporary world moreover does much more than sell. It may exhort us to give to charity, vote for a political party, avoid infection or fight for our country – making a definition of it as a genre seeking to influence behaviour more satisfactory than one which refers only to selling.

The academic literature on advertising language has both reflected, but also led, changing approaches to text analysis – taking in particular a 'social turn' seeing language use in terms of its social functions, a 'semiotic turn' analysing language use in concert with other semiotic systems and an 'ideological turn' seeing language use as reproducing power relations. Research has tended to focus upon large-scale corporate advertising and advertisements which are notably innovative and creative, rather than on small or personal advertisements – with some exceptions (e.g., Thorne and Coupland 1998; Mullany 2004).

Research on the language of advertisements was initiated by Geoffrey Leech's landmark publication *English in Advertising* (1965), which systematically catalogues and analyses the English of advertisements as a variety of the language. Though limited to one language as the title suggests, and generally to language isolated from other semiotic systems, this seminal book not only created a new topic of linguistic enquiry but also opened the way for a gradual rapprochement between linguistic analysis of advertising on the one hand, and the parallel existing traditions of psychological analyses (e.g., Packard 1956) and semiotic analyses (e.g., Barthes 1973: 36–9, 88–91) on the other. Drawing upon techniques from literary stylistics and descriptive linguistics, Leech concentrated upon cataloguing linguistic innovation, patterning and deviation in advertising language. His analysis, though seminal, implicitly adopts the mainstream-linguistics tenet of the time that language, whether studied as a system or in use,

can be separated from other communicative resources.

Realisation of the limitations of such an approach to advertising language has been a prime motive in the development of an analysis of the language of advertisements in interaction with other modes and considered in a social and communicative context. From the 1980s onwards, there has been a growing tendency for work on advertising language to draw and merge with analyses from traditions outside linguistics: notably general semiotic analyses of advertisements (e.g., Williamson 1978; Umiker-Sebeok 1987), sociological analyses (e.g., Goffman 1979) and pragmatics. But there is also recognition that these techniques for elucidating how advertisements signify on a micro-social level need to be complemented by a more macro-sociological analysis which sees advertisements as players in a larger political arena. Analyses of the language of advertisements have thus increasingly drawn upon a further tradition of political and social critique of advertisements which goes back to the work of Marshall McLuhan (1964), Erving Goffman (1979) and Raymond Williams (1980) and continues more recently in such works as Goldman (1992), Nava et al. (1997), Cronin (2000) and Leiss et al. (2000). Nevertheless, while the major books on advertising language which followed Leech's lead may be said to draw to some extent on all of these traditions, each one is also all distinguished by a particular emphasis of its own. Geis (1982) examines the pragmatics, logical implicature and propositional truth of television advertisements with a particular emphasis on how they deceive rather than inform. Dyer (1982) picks up the theme of advertising as communication, speculating in particular upon the effects of their language choices. Vestergaard and Schrøder (1985) draw upon speech-act theory to examine the targeting of specific consumer groups in print advertisements. Cook (1992/2001) considers the creativity, poetics and literariness of advertisements, as well as their identity as a genre. Myers (1994) deals with word choices in advertisements. Tanaka (1994) uses a relevance-theoretical pragmatics approach to Japanese and British print advertisements. Forceville (1996) examines how pictures and words interact to create 'visual metaphors'. Goddard (1998) presents techniques of language analysis in print advertisements for school students. Myers (1999) considers the meanings of advertisements in the context of their production, distribution and reception. Simões Lucas Freitas (2008) looks at the treatment of taboo in advertising, and the ways in which it is represented both verbally and pictorially.

Political analyses of advertising language can be found in works of critical discourse analysis (CDA) taking their cue from comments on advertising and consumerism in Fairclough's seminal book *Language and Power* (1989: 199–211). Fairclough regards the influence of advertising as primarily ideological, reflecting and advancing the values of late capitalism (e.g., efficiency as an aspiration transferred from industrial to personal life), flourishing in a consumerist culture with increased mass communication, and 'colonising' society with 'consumption communities' in which identity is defined more by what one consumes than by other more traditional allegiances. He notes how advertisements are characterised, like many other instances of contemporary institutional discourse, by '**synthetic personalisation**', a tendency 'to give the impression of handling each of the people handled *en masse* as an individual' (Fairclough 1989: 62). These themes are taken up and amplified in later analyses of advertisements such as Goodman and Graddol (2007: 150–16), Chouliaraki and Fairclough (1999: 10–15), and Goatly (2000: 183–213).

Though most of the work listed here (with some exceptions such as Tanaka 1994) draws its examples almost exclusively from advertising in English aimed at English-speaking countries, there is also a growing body of literature looking at advertisements across languages and cultures. Particular focuses of interest have been the impact of Western assumptions and communication norms on other languages and cultures (Tanaka 1994; Usunier 1999; Wang 2000; Ramamurthy 2003; Robbins 2004) and with a more linguistic focus on code switching in ads (Bhatia 1992; Kelly-Holmes 1998, 2004).

Mixing of languages and combinations of writing systems has become particularly common in advertisements in India and in South-East Asia. One Chinese magazine advertisement for cosmetics, for example, is written mostly in Chinese but has the product name into Roman

script and also includes in English, 'SILKY SHINE, / LIGHT MY LIP' deploying, like the British advertisement for Sky, both alliteration and rhythm.

With the advent of the Internet, digital TV and mobile technologies, the nature of advertising is changing again, perhaps on a scale comparable to that influenced by the advent of analogue TV. In addition, receivers of advertisements, at least in countries with an unbroken history of such advertising, may now to a degree be immune to the classic advertising techniques developed from the 1950s, making marketers seek impact through more general means of persuasion such as public relations (Moloney 2006: 22–7) and branding (Ind 1997; Klein 2000). For these reasons, recent years have seen fewer book-length surveys of advertising language as a whole, and a greater focus upon language use in particular types, topics and areas of advertising (e.g., Bolívar 2001; Fuertes-Olivera et al. 2001; Reynolds 2004). Particularly active areas of enquiry include gender and sexuality (Thorne and Coupland 1998; Cronin 2000; Mullany 2004) and the relation of advertisements to other related persuasive genres such as labelling (Cook and O'Halloran 1999), news (Smith 2006), branding (Machin and Thornborrow 2003), Public Relations (Swales and Rogers 1995; Mautner 2005; Cook 2007) and 'service speak' (Cameron 2000).

G. C.

Suggestions for further reading

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Language and education

Research on language in education in the early years of the twenty-first century follows several strands, some with more rigorous theoretical underpinnings than others. One line of research continues from the **educational anthropological tradition**, looking at the classroom as a culture. Another line of research looks at the ways that children are socialised into classroom language and culture; a third does similar work within a **Vygotskian framework**, a fourth with a **neo-Vygotskian activity theory** derived from Leo'tiev; and a fifth applies a postmodern lens to look at discursive frameworks of language and power. In the text to follow, each of these five main lines of research will be fleshed out, with some prognosis as to its potential to generate interesting data in the years to come.

Behaviourist teaching still rules in many settings

Unfortunately, a still-active paradigm all too effectively describes classroom language use on a daily basis: behavioural psychology in the most traditional sense, with teachers deploying language that defines instructional effectiveness in terms of a predetermined set of specifications. Directive, teacher-centred instruction seems to be universal default pedagogy, despite research findings that document successful learning when language is used interactively, toward learner-centred ends. Overall, a daily struggle in the educational use of language is to liberate language from the role of delivery mechanism for the attainment of convergent ends, and to open pathways instead for language to be the means to discover, even create, the heretofore unknown.

Even **cognitive paradigms of education**, ostensibly encouraging the use of a toolkit of critical and creative thinking, have not made significant inroads to replace behaviouralist teaching. This may be due to the inability of cognitive psychology as a parent discipline to utilise other than 'cognitive behaviour' as a measure of intellectual activity.

Two underdeveloped areas of research

Two other promising lines of research into classroom language use – those based on computer-assisted instruction and educational linguistics – have not as yet come of age.

Computer-assisted instruction (**CAI**), when not colonised by cognitive-behaviourist research methodologies, is in a holding pattern until speech-recognition, artificial-intelligence

and intelligent-tutoring researchers can come together to create more interesting instructional conversations. Similarly, educational linguists gamely delineate the classroom as an arena of research without proposing any unique instructional methodology; as a result, educational linguistics per se remains a somewhat hollow research paradigm.

The focus on results

Because stakes are high as education undergoes continual pressure to provide documented returns for investment, the study of the language of schooling has been laden by the constraint that linguists document the efficacy of language in furthering the academic prowess of students. This is not the case in other domains of language use; the study of, say, the discourse of trials is not expected to alter the body of case law, nor is the study of operating-room conversations expected to provide more effective surgery. Yet there exists the continued expectation that linguists become part of the body of experts that advise educators on pedagogical improvement.

Moreover, because of the impact of immigration on the classrooms of the UK, Canada, the USA and Australia, **second-language acquisition theories** have played a role in classroom linguistics in conjunction with educational theories relating to the education of language-minority students. This has given the second-language-acquisition applied linguists perhaps a larger role in issues of language and education than they play in other domains of language use. Sustaining the idea that linguistic research should help to discover more effective ways to learn, in the analyses that follow, the focus is on the importance of academic and socialisation goals of schooling and ways in which the study of classroom language furthers those goals.

Anthropological and sociological studies

In the educational anthropological and sociological research of the late twentieth century, Mehan (1979), Cazden (1988), and Roland Tharp (1989) are foundational. Building on Sinclair and Coulthard's tools for analysing classroom language (1975, 1992) these researchers saw classrooms as cultures, with verbal interaction patterns specific to each context. With students' families and community providing the initial induction into the process of learning, researchers asked whether the school furthered or disrupted that learning process.

Mehan's research addressed inequities in schools, originating the **Achievement Via Individual Determination (AVID) program** as an alternative pathway to academic success for students who had been tracked into non-academic secondary programs. Cazden (1988) investigated linguistic alternatives to teacher-fronted discourse, and Roland Tharp was instrumental in documenting culturally based instructional talk in a variety of cultural contexts. Tharp (1989) went on to explore what he called 'psychocultural variables', in many ways still a robust concept.

Together, these and others (Basil Bernstein, Susan Philips, Shirley Brice Heath, and Henry Trueba, to name a few) provided in-depth analyses of the language of schooling that enabled policy-makers to move beyond destructive 'blame-the-victim' policy-making towards a view that ascribed the limited school success (in particular of cultural and linguistic minorities) to school–community cultural mismatch and intercultural miscommunication. This point of view has in turn been questioned by later discourse theorists, based as it is upon a limited notion of culture that excludes the role of the individual in shaping culture proactively. However, the educational anthropologists and sociologists furnished an alternative to one-size-fits-all views of classroom language; and the typical speech interaction between teacher and students, characterised by highly structured turn-taking restraints and teacher domination, was exposed as an artefact that seldom matches the learning interactions taking place outside classroom walls.

The French sociologist Bourdieu (1977) offered a late-modern analysis of language by explicitly connecting classroom language use to capitalist practices: language functions as social capital, a major form of cultural capital; that is, as a part of the social 'goods' that people accumulate and use to assert power and social class advantage. Bourdieu viewed language as an asset on a par with physical resources. In a capitalist society, those who are native speakers of a high-status language receive their language

skills as a part of their social capital, but those born into a language with lower social status have a lack of language capital to overcome. Those without capital largely remain in that condition. Bourdieu placed schooling, with its behaviours and practices, squarely in the context of the surrounding economic realities. Theoreticians such as Lin (2001) have used Bourdieu's concept of 'habitus' effectively in analysing language use across contrasting educational contexts.

Equally valuable as the cultural insights provided by these researchers were the ethnographic tools that anthropological research offered to investigators seeking an alternative to quantitative methodologies. Rich description, hitherto unaccepted by behaviourally trained researchers, helped to open the way for expanded linguistic analyses of all sorts.

Language socialisation approaches

Language socialisation research is also partially anthropological in focus, as comparative studies have examined how children use language to learn across a variety of cultural contexts. The research framework looks at both the acquisition of language and the use of language (Schieffelin and Ochs 1986).

Language socialisation specialists laid the foundation for the study of identity (Ochs 1993) by employing research studies that focused on the individual's use of language to deploy distinctive acts and stances. The crosscultural focus of language socialisation research lent itself to research on **second-language acquisition** both in and out of the classroom. This focus positions the language socialisation researchers to play a strong role in the study of language and education in the future, as educational language use moves outside the classroom and researchers move with it.

For example, Lam's (2004) study followed two teenage Chinese immigrants in the USA as they concocted Cantonese–English bilingual chatroom discourse that featured code-switching to construct social identities that were characteristic of neither English-speaking Americans nor Cantonese-speaking Chinese. Lam's research, following a multi-contextual approach to language socialisation, tracked these youths through real and virtual unique language worlds. This suggests that in the absence of their own linguistic research paradigms, computer-assisted-learning researchers could easily adopt language socialisation study methods toward their own ends.

Language and thought according to Vygotsky

A **Vygotskian framework** underlying research on language and education shares much in common with an anthropological and sociological focus, with a strong emphasis on the social influences upon the individual's learning – the chief distinction between Vygotskian-based researchers and others being the explicit citation of Vygotsky. Not only is the role of language paramount in learning, according to Vygotsky, but the importance of the social group in setting parameters for internalising language places the classroom focus on peer-to-peer language use, effectively decentralising the teacher. Vygotskian learning theory has been useful in providing a substrate that connects language and learning as processes that are theoretically and cognitively linked.

Future research in this area will explore more closely the language elements that characterise the zone of proximal development – how teachers or more experienced peers work with a learner to establish a foundation of the currently known in order to build from that relevant and appropriate new knowledge schemata. In addition, researchers are pressing ahead with ways to delineate how language use sustains – or circumscribes – identity; and how the identity of the learner shapes the language that is used to learn. These insights are possible because the Vygotskian paradigm posits a learner who is socially situated, but whose language use is first social and then individual – a notion that fits well with a postmodern suggestion that culture as a substrate is actively shaped by the participant. This is consonant with whole-language reading methodologies and other pedagogies that encourage the learner as a co-constructor of meaning (see Toohey 2000; Toohey and Norton 2003).

Activity and community-of-participation theories

Vygotsky's student Leont'ev developed **activity theory**, studying the interaction between the

individual, the artefacts (tools) that are situated within the setting and other individuals. According to activity theory, the society at large is the sum total of the activity systems that are developed and maintained by its members (Wells 1998). A model of activity theory developed by Engeström (1990, 1996) systemises the multiple variables that must be examined when looking at classroom processes; because it is closely linked to Vygotskian perspectives on the centrality of language, it provides a useful unifying framework for other kinds of influences on learning.

Although of differing theoretical origin, activity theory and the **communities of practice model** developed by Lave and Wenger (1991) are compatible in that they conceptualise learning not as a separate and independent activity of individuals, but as an integral part of participation in a community. Learners return to dynamic and interactive communities after a day of school. Teachers must come to know and respect what the community offers students, and encourage knowledge to travel a two-way path as it circulates from school to home and back to school. Thus, learning is both an individual and communal activity (McCaleb 1994). The **'funds of knowledge' approach** uses the cultural practices of households and communities as resources that can be connected in a meaningful way to the school curriculum, linking language, culture, and community (Moll 1992; González and Moll 2005).

Postmodern emphases on language and power

The study of classroom language in a postmodern world incorporates four important implications: revised understandings about power, about teachers'/learners' identities, about technologies of knowledge and about language itself.

In the twenty-first century, depictions of the language–power connection have come to play an ever-larger role in educational research. For Foucault (cf. 1980), language is inseparable from the workings of power; the struggle for power is 'a struggle for the control of discourses' (Corson 1999: 15). Foucault outlined the ways in which authorities have used language to repress and disempower social groups in favour of those in power, and how certain social groups have appropriated language practices for their own ends. Foucault's contribution to the study of language and education, although indirect, is profound (see Gore 1994). In classrooms of the modern era, there was no question who had power – the teacher, the authorities and the discourse deployed by the school. In the postmodern shift, power circulates; instead of the pretence that power is non-negotiable, unavailable and neutral, students gain the power to speak, to use a public voice toward their self-determined ends.

In the modern world, one's identity was imprinted by one's primary socialisation and encoded in one's native language. In the postmodern shift, identity is seen as an internal resource. What time, energy, and personal characteristics is the learner willing to invest, and how is this done? Postmodern identity is flexible, multiple, and extended (Weedon 2004). Postmodern learners are poly-cultural, as identity boundaries dissolve and people resonate in self-created social groups, or conversely in groups unhappily lumped together by the substandard housing available to immigrants. At these extremes, language is inextricably linked to identity, creating agents who further social cohesion or foment social anomie, in school contexts that empower or exploit the individual learner (see Cummins 2000b).

Linguists must track technologies of knowledge that have changed dramatically in the postmodern world. The four major components of postmodern techniques of knowledge are constructionism, intercultural positioning, metarational thinking and cybertutorial technologies (Díaz-Rico 2004).

Constructionism endorses interactive creation of meaning. Meaning is not constant, within the structure of a language, or the structure of a given text; it is increasingly negotiated (Nikolov 2000; Ribé 2000). Teachers leave behind one-size-fit-all methods and negotiate activities and objectives based upon the needs of the learner, using knowledge of individual differences and encouraging metacognition and self-reflection, with the goal of increasing student self-knowledge and conscious meaning-making capacity.

Intercultural positioning incorporates the primary language and the primary culture of the learner. This emphasis redefines the teacher and

student both as learners: intercultural educators become learners about the language and culture of the students and serve as a model for learners, who in turn must synthesise their own multiple languages and cultures into a personal polyculturality. Case studies such as Lam (2004) document this process.

Meta-rational thinking acknowledges that postmodern learning does not engage solely the rational mind; teachers must dip into the imaginary to teach. This implicates visual to augment verbal expression and decouples the learner from the belief that rationality is the only desirable mode of thinking, permitting the yoking of emotion to logic, and both to language. Therefore semioticians must forge a wider vocabulary to describe the language that results (see Kress and van Leeuwen 1996). As people live in a perpetual presence of the Internet and televised images and sound-bites, verbal language will share power in education with an expanded semiotics of communication incorporating new syntheses of music, movement, and visual arts.

Cybertutorial technologies describe the computer-learner connection. These are not pre-programmed tutorials, in which basic skills are carefully sequenced in computer-managed drill-and-kill. This is learner-managed information access, with project-based learning at its core. The Internet empowers the **learner-as-creator** to spin a personal web of knowledge. Students who 'surf the Web' to complete projects use language purposefully and independently, becoming, in effect, their own tutors. Until computer-assisted learning finds a unique voice, paradigms of language socialisation seem most often employed to describe and document CAI.

The language used in learning will become postmodern; English will become the world's English, with multiple vernaculars, dialects and purposes. Substantial tensions lie ahead in relation to the role of world languages, heritage languages, language policies and information access and control.

The challenge for linguists is to characterise the language used for learning, within or without the classroom context, in such a way that the educational use of language furthers personal, creative, polymodal learning – and in contexts that are equitable for all learners.

In the quotation below, McNicholls (2006: 73) describes the goal of children's literature, but she could also be describing the best use of classroom language:

> its use must aim to take advantage of children's innate imaginative potential and playfulness and serve as a springboard for their own creativity, verbal or not … This focus is born of a deeper belief in the need for education to prepare future citizens capable both of appreciating the otherness represented (e.g., by a foreign language or culture as a source of richness and stimulus rather than as a threat) and of responding with their own creative and autonomous initiatives to the problems that arise in their lives and their community.
>
> L. T. D.-R.

Suggestions for further reading

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Toohey, K. and Norton, B. (2003) 'Autonomy as Learner Agency in Sociocultural Settings', in D. Palfreyman and R. Smith (eds), *Learner Autonomy Across Cultures*, London: Palgrave, Macmillan, pp. 58–72.

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Language and new technologies

The phrase 'new technologies' is problematic because newness becomes old very quickly. This is especially the case here, because by the time the new edition of this book (an 'old' technology) gets into print, the new technologies being discussed here will have dated and there will be new tools for communication which will not

have been covered by this article. The first message, then, is that technology is always on the move, and language is on the move with it.

Not every new communications technology can be covered in an article such as this. For that reason, the focus will be on two particular technologies that appear to have generated clear contexts for new forms of language: those are **Short Message Service** (**SMS**), and computers.

SMS, known popularly as **text messaging** (or **txt messaging**, to distinguish SMS from the more generic form, 'text'), has turned the telephone from a sound-only medium to one where choices can be made between speaking and writing. Multimodal choices are also available, where, for example, a photographic image is given a written caption, or a video clip or sound file is attached to a txt message.

The language conventions of **txters** will be highly dependent on the nature of the user(s). As with other forms of language use, txters are likely to have a repertoire of styles to suit the different audiences and purposes surrounding their communication. The affordances of the communication tool itself, however, have also changed rapidly, so that **txting practices** have been subject to the capacity of the technology at any one time. For example, the **predictive txt facility**, whereby the system offers to spell those words that are frequently used by the txter, will have had an impact on the extent to which txters use abbreviations, a feature which has been seen by researchers as almost the defining characteristic of txting language.

Thurlow (2003) proposes a number of **sociolinguistic maxims** which, he claims, account for the linguistic features typically observed in txt data. These are: brevity and speed, paralinguistic restitution and phonological approximation.

Brevity is seen to be at a premium in the txt environment because of the need for fast give-and-take, as txters use their communication to make on-the-hoof arrangements with each other and negotiate immediate social events. **Brevity** also has an important economic motivation, of course, because txting costs money: phone contracts will specify a maximum number of free txts within a particular tariff. In addition, what counts as a single message is shaped by the total number of characters available: historically, this has been 160 symbols, including spaces. Given these constraints, someone on a limited budget will try to use the minimum number of symbols and batch their messages as much as possible into one electronic submission.

The maxim of **paralinguistic restitution** demands that abbreviations allow the reader to recover meaning, so judicious choices need to be made by the writer about what can be omitted. Common abbreviations noted by Thurlow include **shortenings**, where final letters are omitted (for example, 'lang' for 'language'); **contractions**, where middle letters are omitted (for example, 'gd' for 'good'); and **clippings**, where final letters are omitted, particularly the letter 'g' (for example, 'goin' for 'going'). Further examples of abbreviation include **initialisms**, such as 'v' for 'very'; and letter/number homophones, such as '2' for 'to'.

Thurlow's **maxim of phonological approximation** involves maximising the potential for writing to represent sounds. This can be for a number of reasons. It may be, for example, that a txter wants to represent their own accent (for example, a London accent in 'wiv', instead of 'with'). Or it may be because a txter wants to symbolise spoken interjections or paralinguistic effects such as laughter, features described as **blurted vocalisations** by Goffman (1981). To reinforce the **affect dimension**, txters, like **emailers**, can employ a whole range of **emoticons** – symbols originally made up of punctuation, representing facial expressions – to ensure that readers do not mistake a nuanced message and read sarcasm where none was intended, or mistake a joke for serious comment.

Both Thurlow (2003) and Shortis (2007) suggest that, although txting is often represented in popular discourse as a brand new, radically different and potentially chaotic form of language, txting shares many features with some traditional usages, particularly around spelling – for example, the 'phonetic' spellings seen in trade names, in texts from popular culture such as advertising, and in children's early writing. Shortis describes a long-standing tradition of what he terms 'vernacular spelling'. Both researchers argue that txt spelling is well motivated and rule governed.

The fact that txting might need to be defended as a communicative practice might come as

a surprise to some readers. However, both Thurlow (2003) and Shortis (2007) point to the nature of public opprobium visited on this form of language in some media publications with an agenda around supposedly falling educational standards. Shortis points to the coverage given to a story about a school pupil who produced txting language in an exam answer, and suggests that the txt has been contrived and that the whole account is mythic (as Cameron 1995 has suggested is the case for many 'political correctness' stories that have featured in the same media publications). Thurlow points to the moral panic frequently triggered by the combined theme of young people and technology. Merchant (2001) echoes this idea, but with reference to internet use.

If moral panic surrounds the idea of txting language in structural terms, the idea of txting as a social practice is more ambiguously depicted. For every press story about people divorcing each other and employees being sacked by txt message, there is another about the role of a txt message in a mountain rescue or in saving someone from violence. For example, after the Virginia Tech incident in the USA in 2007, where a student shot many of his classmates over the course of several hours, commentators criticised the university's use of email to warn students to stay off campus, suggesting that txting students' phones was a much better strategy to keep them safe. Noting that for many students, email represented a form of older technology and one they associated with their parents, phone companies were quick to offer educational institutions SMS facilities for broadcasting txts to the whole student body instantaneously.

Thurlow (2003) suggests that many everyday uses of txting are dialogic, by which he means that interlocutors exchange txts at high speed, creating an impression of interactivity. He finds that many messages serve the function of making arrangements with friends, relatives and romantic partners and generally staying in touch with the significant people in our lives, and he paints a picture of txting as a practice that is deeply embedded in the social and emotional life of the nation. To what extent this is a global practice is difficult to say. There is some evidence, as one might expect, that there is variation between different cultural groups in the use of this tool, not least because of different socio-economic conditions. But Scollon (2001) also suggests differences in politeness rules, with an expectation in Hong Kong that mobile phones are an 'always on' accessory, while in Finland politeness is signified by leaving one's phone behind on social occasions.

The mobility of the new generation of phones has freed individuals from the fixed indexicality that was previously a part of the world of landline connections. Bauman (2000) sees a whole range of ways in which modern social arrangements are based on much looser, more mobile points of contact, terming this new condition of existence **liquid modernity**. Nowhere have the previous spatial reference points for communication been so thoroughly refashioned as in **computer-mediated communication** (**CMC**). Stone (1995) sees the whole computer environment as having 'the architecture of elsewhere' because it is always unclear to users exactly where their communication is taking place. CMC forms the focus for the next part of this article.

Herring offers a basic definition of CMC as 'communication that takes place between human beings via the instrumentality of computers' (Herring 1996: 1). Conventionally, a distinction has been made between genres such as **discussion boards** and **email**, seen as types of **asynchronous communication**, and **synchronous** forms such as **online chat**, distinguished by their real-time nature. However, as time has gone on, these distinctions have blurred, with increasingly sophisticated 'alerts' available to users letting them know whether others are online or not; and with real-time writing systems such as Microsoft's **MSN Chat** letting users know that their interlocutor is busy at the keyboard writing a reply. In this new world of subtler distinctions, the term 'quasi-synchronous' is used to label the form of writing where participants, though necessarily online at the same time, are not informed by the software whether their interlocutor is typing or not.

The early distinctions of CMC into synchronous and asynchronous genres encouraged a view that the former had a lot in common with speech (because of its real time nature) while the latter had more commonality with writing. However, attempts to draw such neat lines as

this soon foundered – as, indeed they did for notions of binary difference between pre-CMC speech and writing (see Street 1988 and Gee 1990 for critiques of the idea of a 'great divide' between speech and writing). As a single example of how new CMC genres confound discrete accounts of speech and writing, consider the fact that computer-based chat tools are both interactive (therefore 'speech-like') and editable (a property associated with writing). See Goddard (2004) for further discussion of models of speech and writing as they relate to CMC.

Crystal (2001), labelling CMC as 'Netspeak', does initially make some attempt to frame CMC in terms of a binary, speech-writing schema, but then concludes that 'Netspeak is identical to neither speech nor writing, but selectively and adaptively displays properties of both … Netspeak is more than an aggregate of spoken and written features … it does things neither of these mediums do, and must accordingly be seen as a new species of communication' (Crystal 2001: 47–8).

Descriptions of CMC which approached it as a single entity, or which saw synchronicity as the single difference between types of CMC, have given way to more detailed accounts of the 'affordances' (Sellen and Harper 2002) of the particular CMC tool in its context of use. Herring (2001) notes that early research tended to produce overgeneralisations, seeing linguistic features as a part of the medium rather than as a choice made by the users. The result of such generalisations was to stereotype forms of CMC discourse – for example, that **online chat** is, by its very nature, 'anonymous' and 'impersonal' (Herring 2001: 613).

At the same time as the analysis of different **CMC genres** has become more fine-grained, the use of **CMC tools** has become more widespread and embedded both in organisations and in the private lives of individuals. In a study of a **chat tool** used on a UK university course in 1999/2000 (Goddard 2004), 60 per cent of the group had either never been online before or only on a rare occasion. Now, in comparative groups, it is rare to find even a single individual with that profile. **Virtual Learning Environments** (**VLEs**) are common in large parts of the UK education sector; and email communication is an expected part both of working life and of learning and teaching contexts. For example, Davies et al. (2007) illustrate the use of this communication tool by students to apologise to tutors for missing their lectures (and of course to ask for copies of the lecture notes).

Herring (2004) notes a change in CMC research from an earlier idea of cyberspace as a new, extraordinary and unknown frontier, towards more of a sense of CMC as utilitarian, everyday communication: the title of her paper, 'Slouching Towards the Ordinary' suggests a second wave of scrutiny which is more grounded in its expectations. A practical example of this shift can be seen in the development of **Instant Message** (**IM**) **systems** such as MSN Chat, where participants chat with identified users in their friendship groups. See Merchant (2001) for an account of teenage use of these systems.

An increased focus on the ordinary and the everyday does not preclude the idea that CMC is without creative skill. In fact, Goddard (2003) shows that chat tools require skills that can be likened to those of literary authors; and Chandler (1998) notes that in the new world of Web 2.0., with its user-generated content, individuals become authors of their own identities over and over again, as identities, like websites themselves, are constantly 'under construction'.

As with txting, CMC attracts both utopian and dystopian coverage in the media. For every story about the Internet celebrating the reunion of long-lost lovers, there is another which warns of lurking paedophiles. For every story of email exposure of company corruption, there is another about its use in cyber-bullying. For every story about **social networking sites** (**SNS**) as providing friendship and entertainment for individuals, there is another which warns that such sites are honey pots for marketing companies to gather data. As new technologies continue to emerge, and older technologies continue to merge, this area will continue to offer rich opportunities to analyse new forms of communication and the public discourses associated with it.

A. G.

Suggestions for further reading

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Language, gender and sexuality

The publication of Robin Lakoff's *Language and Women's Place* (1975) has often been cited as the primary catalyst for over three decades of research in the area of language and gender. Early work in the field was generally structured around two central questions, framed by Kramer et al. in a 1978 *Signs* review article in the following way: '(1) Do women and men use language in different ways? (2) In what ways does language – in structure, content and daily usage – reflect and help constitute sexual inequality?' (Kramer et al. 1978: 638). In this article, I will describe early approaches to language and gender in terms of these two central questions. At the same time, I trace the development of the field of language and gender, from its original associations with second-wave feminism to its more recent alignment with postmodern approaches to feminism.

Gender-differentiated language use: dominance vs. difference frameworks

Language and gender research in the 1970s and 1980s generally took 'difference' between women and men as axiomatic and as the starting point for empirical investigations. That is, either implicitly or explicitly, it was assumed that women and men constituted dichotomous and internally homogenous groups and the goal of research was both to characterise the difference in their linguistic behaviour and to explain its occurrence. The first kind of explanation, referred to as the **dominance approach**, viewed male dominance as operative in the everyday verbal interactions of women and men, giving rise to linguistic reflexes of dominance and subordination. For example, in the classic work, *Language and Woman's Place*, Robin Lakoff (1975) argued that women use linguistic features of tentativeness, insecurity and powerlessness (e.g., **tag questions**, **declaratives with rising intonation**) as a result of early socialisation practices that produce women as subordinate to men. For Lakoff, women face a double bind: if they do not learn to speak like 'ladies' they are ridiculed and criticised; alternatively, if they do speak like 'ladies' they 'are systematically denied access to power, on the grounds that they are not capable of holding it as demonstrated by their linguistic behaviour' (Lakoff 1975: 7). While Lakoff's claims have been critiqued over the years on political, methodological and empirical grounds, her work, as noted above, has been enormously influential and is generally viewed as the primary impetus for over three decades of research in the area of language and gender. Other versions of the 'dominance' approach can be seen in the work of Pamela Fishman (1978) and Candace West and Don Zimmerman (1983). Fishman documented the **conversational shitwork** women perform in order to sustain conversations with men, while West and Zimmerman identified interruptions as a site of men's conversational dominance. Fishman's work is noteworthy because, like many other responses to Lakoff's work, it reinterpreted the function of certain features of 'women's language', casting women as agents attempting to resist male dominance rather than simply as victims. For example, instead of viewing tag questions as signs of uncertainty and deference, as Lakoff did, Fishman argued that tag questions (and other kinds of questions) represent creative strategies that women deploy in negotiating the greater power of their male conversationalists.

A second type of explanatory account of men's and women's linguistic differences was known as the **difference** or the **dual-cultures approach**. There was little dispute between 'dominance' and 'difference' theorists about gendered linguistic differences; what was at issue is how such differences are best explained. The 'difference' or 'dual-cultures' model had its origins in work by John Gumperz (1982a, 1982b) on the nature of cross-cultural or inter-ethnic communication. Demonstrating that communication between interlocutors from different cultural groups can be problematic due to differences in conversational norms, Gumperz

showed that interlocutors themselves often do not perceive this kind of conversation difficulty as rooted in linguistic differences; rather, on the basis of such difficulty, speakers will often make value judgements about their interlocutors' personality characteristics. One of Gumperz's points concerns the imperceptibility of conversational norms: despite genuine attempts to communicate on the part of speakers, their unwitting violation of unrecognised norms can function to reinforce and perpetuate negative cultural stereotypes.

Applying Gumperz's account of problematic cross-cultural communication to male–female communication, work by Daniel Maltz and Ruth Borker (1982) and later Deborah Tannen (1990) suggested that women and men, like members of different cultural groups, learn different communicative styles because of the segregated girls' and boys' peer groups they play in as children. This segregation results in inadequate or incomplete knowledge of the other groups' communicative norms, which, in turn, leads to miscommunication. A crucial point for Tannen (1990) in her popularised best-selling book, *You Just Don't Understand: Men and Women in Conversation*, was the legitimacy of both men's and women's conversational styles: 'misunderstandings arise because the styles [women's and men's] are different' and 'each style is valid on its own terms' (Tannen 1990: 47). Indeed, it was often the so-called neutrality of women's and men's communicative styles that was critiqued by scholars advocating a 'dominance' rather than a 'difference' or 'dual-cultures' approach. That is, in arguing that women's and men's styles are separate but equal, as Maltz and Borker and Tannen did, proponents of the 'dual-cultures' model ignored the power or dominance relations within which men's and women's conversational styles are developed – power relations that help to *shape* the particular forms that these styles take. It is not merely an accident, for example, that men, more than women, interpret questions as requests for information or interpret problem-sharing as an opportunity to give expert advice. (These are claims made by Tannen (1990) about men's speech styles.) As Crawford (1995: 96) says of these tendencies: they 'can be viewed as prerogatives of power'. In choosing these speech strategies, men take to themselves the 'voice of authority'. Put another way, locating explanations for women's and men's different communicative styles in their so-called separate peer groups obscures the effects of power on the particular way these styles come to be constituted.

In hindsight, the vigorous debates engaged in by 'dominance' and 'difference' theorists are somewhat surprising, given the commonalities that existed between the two positions (Cameron 2005). As noted above, proponents of both theories assumed that men and women were dichotomous and internally homogenous groups and researchers' explicit goals were to document and explain differences in linguistic behaviour. For the most part, both viewed linguistic differences as arising from childhood socialisation practices. And, both restricted their empirical and/or anecdotal evidence to a mainstream North American population (i.e. white, middle-class men and women), often overgeneralising their results beyond such groups. Like much second-wave feminist theory, then, 'difference' and 'dominance' theorists conceptualised 'women' and 'men' as undifferentiated categories and sought to describe differences between them.

Influenced by feminist scholarship more generally, language and gender research in the 1990s began to question the categories taken as fundamental to earlier research. That is, assumptions about 'women' and 'men' as binary opposites with little internal heterogeneity were challenged on the grounds that they ignored the differences created by other aspects of social identity. More recent formulations of the relationship between language and gender have abandoned categorical and fixed notions of gender in favour of more constructivist and dynamic ones. In particular, these formulations, following Butler (1990), emphasise the performative aspect of gender: linguistic practices, among other kinds of practices, continually bring into existence individuals' social identities. Under this account, language is one important means by which gender – an ongoing social process – is enacted or constituted; gender is something individuals *do* – in part through linguistic practices – as opposed to something individuals *are* or *have* (West and Zimmerman 1987).

Gendered linguistic practices as symbolic/ideological categories

The idea that **gendered language** is not a set of permanent traits residing in individuals but rather practices repeatedly drawn upon in the construction of identities has led to a rethinking of the notion of **women's language**. Indeed, in line with much research on language and gender in the 1990s, which called into question the existence of women's language as an empirically based category, Susan Gal (1991, 1995) argued that categories of 'women's speech' and 'men's speech' 'along with broader ones such as *feminine* and *masculine*' (emphasis in original) are not empirical constructs but rather symbolic-ideological ones. That is, they become symbolically associated with cultural ideas about masculinities and femininities and, in turn, serve as social/cultural resources for the enactment of gender. Put somewhat differently, newer approaches to language and gender adopt a **social constructionist approach to gender**, an approach whereby 'gender … is not an actual free-standing phenomenon that exists inside individuals' but rather 'is an agreement that resides in social interchange; it is precisely what we agree it to be' (Bohan 1997: 39).

Given that what constitutes gender is socially constructed or, in Bohan's terms, is 'an agreement that resides in social interchange', a question arises about the process by which certain linguistic behaviours and practices become invested with gendered meanings in particular communities. In a paper that represented a significant contribution to social constructionist and performative approaches to language and gender, Elinor Ochs (1992) drew upon the notion of indexicality as a way of explicating this process. Ochs (1992: 340) argued that 'few features of language directly and exclusively index gender'. Rather, it is more frequently the case that language *indirectly* indexes gender. For Ochs, a *direct* indexical relationship between linguistic forms and gender is exemplified in personal pronouns that denote the sex/gender of an interlocutor. To say, by contrast, that most linguistic features *indirectly* index gender is to say that the relationship is mediated by the social stances, acts, activities and practices that are gendered in a particular community. In Japanese, for example, there are certain sentence-final particles that index assertiveness and intensity, and others that index uncertainty and hesitancy (see Inoue 2002). Because there is a symbolic association in Japanese culture between men and assertiveness, on the one hand, and women and uncertainty, on the other hand, these sentence-final particles come to be viewed as part of 'women's language' and 'men's language', respectively. Consider further the example of tag questions in English: tag questions may display or index a stance of uncertainty or tentativeness, as Lakoff (1975) suggested, and, in turn, a stance of uncertainty may in some English-speaking communities be associated with femininity. This led Lakoff to conclude that tag questions are a direct and exclusive reflex of femininity. However, as Ochs argued, because such a relationship is, in fact, indirect and non-exclusive, it is possible for a tag question to index another kind of stance – one symbolically associated with masculinity as opposed to femininity. For example, a tag question uttered by a cross-examining lawyer in a trial context may index a verbal act of coercion (e.g., *Sir, you did go to your girlfriend's house on the night of her murder, didn't you?*) which, in turn, may be construed as masculine in some communities (see Cameron 1992 for a discussion of this aspect of tag questions). What the preceding discussion reveals, among other things, is the greater agency ascribed to social actors under **social constructionism**. If gendered linguistic practices are not fixed traits but social and cultural constructs indirectly and symbolically associated with gender, then individuals can presumably construct their gendered identities (or interpret others' identities) by drawing upon (or interpreting) these symbolic resources in various ways.

A social constructionist view of gender, not surprisingly, has shifted the focus of research in the field of language and gender away from documenting differences between men and women's linguistic behaviour to investigating how linguistic resources are involved in the production of gendered subjects. Moreover, because **gendered linguistic practices** are understood as symbolic and ideological categories, much language and gender research since the early 1990s has examined the extent to which individuals draw upon, negotiate and/or contest

the ideologies of language and gender that a community or culture makes available. And, given that individuals, including those of the same gender, may make use of these ideological resources in different ways, what has been emphasised in recent work is the diversity – as opposed to the homogeneity – of gendered categories.

Gender diversity across communities of practice

One influential attempt to theorise the diversity of linguistic practices within gendered categories is the 'communities of practice' framework developed by Penny Eckert and Sally McConnell-Ginet (1992). Eckert and McConnell-Ginet advocated a shift away from overarching generalisations about women, men and gendered speech styles, emphasising the need to 'think practically and look locally'. They recommend that the interaction between language and gender be examined in the everyday social practices of particular local communities – what they term 'communities of practice' – because patterns of linguistic behaviour and gender arise from individuals' habitual engagement in local social practices. If women and men engage in different kinds of communities of practice (e.g., yoga classes vs. competitive sports) in certain communities, as they often do, then gendered linguistic differentiation may develop as they negotiate the differing goals and social relationships of these communities of practice. By the same token, given that the gendered dimensions of community of practice membership are local and context-dependent, it is also possible for members of the *same* gendered category to participate in *different* kinds of communities of practices, leading to linguistic variability within a gendered category.

Penny Eckert (1998), for example, showed that the linguistic behaviour of adolescent girls and boys in a Detroit high school interacted in interesting ways with two class-based communities of practice – **jocks** and **burn-outs**. Not surprisingly, the jocks, a middle-class community committed to participation in school-sponsored activities, had more standard pronunciations than the burn-outs, a working-class community whose activities were defined in terms of their independence from the school. Yet, it was not the case that the girls in both groups had more standard pronunciations than the boys. While the jock girls had the most standard pronunciations of the four groups, the burn-out girls had the least standard pronunciations. Such a finding, of course, does not unequivocally support the generalisation that women's use of standard variants is greater than men's (a generalisation that pervades the variationist literature on language and gender) nor, more generally, does it support the idea that women's use of language is homogeneous. Eckert's use of the **community of practice framework** thus exposes the premature generalisations that can result from abstracting gender away from the specific social practices of local communities.

Also examining the **language of adolescents**, Mary Bucholtz (1999) reports on findings from a study of self-identified **nerd girls** in a northern California high school. Bucholtz argued that the nerd girls used a hyper-standard, formal variety of English as a way of distancing themselves from the mainstream version of femininity considered 'cool' in the high school. According to Bucholtz, the nerd girls were proud of their intelligence and academic achievement and drew upon these linguistic resources as a way of disassociating themselves from what they perceived to be trivial adolescent (feminine) matters. Bucholtz's paper resonates with contemporary language and gender scholarship to the extent that it focuses on how gender is constituted 'less by contrast with the *other* gender and more by contrast with other versions of the *same* gender' (Cameron 2005: 487, emphasis in original).

In illustrating the diversity of linguistic practices within gender categories, work such as Eckert's and Bucholtz's also demonstrates the extent to which some individuals adopt linguistic practices that do not conform to the normative expectations of their gender. For example, the burn-out girls in Eckert's study had the least standard pronunciations of all four groups, defying the claim that women are more polite or more sensitive to prestige-norms than men and Bucholtz's nerd girls adopted a hyper-intellectual linguistic persona, one traditionally associated with masculinity.

McElhinny's (1995) study of the **interactional styles of male and female police**

officers in Pittsburgh offers another good example of women departing from traditional norms of femininity. In moving into a traditionally masculine workplace, McElhinny found that female police officers did not, as might be expected, adopt an empathetic and warm interactional style associated with many traditionally female workplaces (e.g., nursing, secretarial work, social work, etc.). Rather, McElhinny argued that both women and younger, college-educated men in the police force adopted a 'bureaucratic' interactional style – a rational, emotionless and efficient interactional style associated with middle-class masculinity. For the female police officers, then, venturing into contexts traditionally associated with the other gender meant that they engaged in social practices, including linguistic practices, that were also associated with the other gender. McElhinny (2003: 26) suggests that one way of elucidating the 'non-naturalness' of mainstream gender norms is by investigating men and women, like the Pittsburgh police officers, who move into 'spheres and spaces often predominantly associated with the other'. Another way is to concentrate on individuals and groups who transgress sex/gender norms in somewhat more remarkable ways.

Performativity: transgressive and 'queer' identities

Performing or doing gender is probably most evident when non-normative or transgressive identities are involved. In other words, Butler's theoretical claim – that gendered identities do not exist beyond their expression – is probably most transparent when an individual's expressions of gender depart dramatically from what we take to be their 'true' gender. For Butler, cultural norms make certain performances of gender seem natural; in Butler's words, such performances 'congeal over time to produce the appearance of substance, of a "natural" kind of being' (Butler 1990: 49). It is perhaps not surprising, then, that language and gender researchers influenced by Butler have attempted to challenge the 'naturalness' of normative conceptions of gender by investigating the linguistic practices of those who transgress mainstream gendered norms in quite extraordinary ways.

Kira Hall (1995), for example, investigated the linguistic practices of telephone sex workers in California who adopted a way of speaking on the job that was strongly reminiscent of Robin Lakoff's 'women's language'. Clearly, for these telephone sex workers, there was a close connection between the powerless femininity indexed by features of Lakoff's 'women's language' and a feminine persona that, they believed, was sexy and erotic for their clients. What is particularly interesting about the telephone sex workers was the fact that most of them were consciously and deliberately performing a version of femininity that deviated from their 'true' identities: African-American women performed white identities, white women performed Latina identities and a majority of the workers were lesbians performing hyper-stylised versions of heterosexuality (indeed, one of the workers was a man).

That drag also reveals the performative nature of gender is evident in Rusty Barrett's ethnographic study (1999) of African-American drag queens as they performed in gay bars in Texas. Barrett argued that the drag queens, like the telephone sex workers of Hall's study, used a version of Lakoff's 'women's language' but not exclusively. They also code-switched into **African American Vernacular English** (**AAVE**) and a style of speech stereotypically associated with gay men. According to Barrett, linguistic choices such as AAVE or **gay male speech** 'are used to "interrupt" the white-woman style, to point out that it reflects a performed identity that may not correspond to the assumed biographical identity of the performer' (Barrett 1999: 323).

The final example of the relationship between **transgressive identities and linguistic practices** is Kira Hall's and Veronica Donovan's (1996) study of the ***hijras*** – a socially ostracised group in India often regarded as a **third sex**. The *hijras*, for the most part, live in segregated communities due to their socially marginal status. Because the majority of *hijras* are born and raised as boys, their entry into a *hijra* community often involves learning to perform a new gender identity: an identity, according to Hall and O'Donovan (1996: 239) 'which distances itself from masculine representations in its appropriation of feminine dress, social roles, gesture and language'. (Hall and O'Donovan report that more than 75 per cent of the *hijras*

living in India today have undergone genital surgery, i.e. castration.) While it might be expected that well-socialised and experienced *hijras* would always linguistically gender themselves and other *hijras* as feminine (Hindi has an extensive and obligatory morphological system signalling gender), Hall and Donovan found this not to be the case. Rather, Hall and Donovan determined that the *hijras* made variable use of the grammatical gender system depending on whether they wished to convey social distance from a referent or addressee or solidarity with a referent or addressee. Indeed, consistent with the cultural meanings associated with masculinity and femininity in India, the *hijras* employed the grammatical markings of masculinity and femininity to convey such meanings: masculine grammatical markings to signal social distance and feminine grammatical markings to signal solidarity. We see, then, that the *hijras* demonstrate in a very dramatic way what Butler claims about the most conventional of gendered identities: individuals make *variable* use of linguistic forms, styles and/or genres in order to *vary* their gendered personae from moment to moment, and from context to context (Cameron 1997).

Gendered linguistic representations

As noted above, early work on language and gender was generally structured around two central questions (Kramer et al. 1978: 638): '(1) Do women and men use language in different ways? (2) In what ways does language – in structure, content and daily usage – reflect and help constitute sexual inequality?' This section describes research that addressed the second of these questions, that is, how are sexist and androcentric ideas encoded in language and how do such encodings produce and reproduce gendered inequalities? Early work on the issue of sexist language (e.g., Lakoff 1975; Spender 1980) problematised the way that language, in its structure and lexicon, differentially represents women and men. Elaborating on the negative effects of this differential representation for women, Nancy Henley made the claim that language 'defines', 'deprecates' and 'ignores' women (Henley 1987, 1989). An example of the way that language 'deprecates' women can be seen in the work of Muriel Schulz (1975), who documented what she called the **semantic derogation of women** in unequal word pairs such as *bachelor – spinster*, *master – mistress*, *governor – governess* or *warlock – witch*. Although parallel at some point in the history of English, Schulz argued that these pairs have not developed in a uniform way: systematically over time the terms designating women have taken on negative connotations in a way that the terms designating men have not.

In addition to elucidating the perjorative nature of terms and meanings associated with women, early work on sexist language pointed to the way that **masculine generics** such as *he* and *man* render women invisible (in Henley's terms, they 'ignore' women). Empirical support for such claims was adduced by a substantial body of psycholinguistic research that showed *he/man* generics to readily evoke images of males rather than of males and females, to have detrimental effects on individuals' beliefs in women's ability to perform a job and to have a negative impact on women's own feelings of pride, importance and power. (For a review of this work see Henley 1989). A study by Sandra Bem and Daryl Bem (1973) is a good example of this kind of empirical research and provides striking evidence of the potential for *he/man* language to negatively affect women's employment opportunities. Bem and Bem composed three versions of a job advertisement. In all three cases, the duties listed were identical, but different terms were used to refer to the position. The first advertisement used *linesman* and the pronoun *he;* the second used *linesperson* and *he or she;* and the third used *linesperson* and the pronoun *she*. More women applied in response to the inclusive language of the second advertisement (*person*, *he or she*) than to the exclusive language of the first one (*man*, *he*); and notably, still more women applied to the female-specific language of the third advertisement (*person*, *she*). Thus, whether or not generic readings are intended by the use of *he/man* language, empirical research has suggested that in many contexts interpretations do not correspond to intentions. And, as the Bem and Bem study shows, male-specific interpretations of so-called generics can adversely affect the lives of women.

This sort of documentation of the negative effects of *he/man* generics was a major impetus

behind non-sexist language reform efforts of the 1970s and 1980s. That is, advocates of non-sexist language reform introduced alternative linguistic forms into languages with the intention of supplanting male-defined meanings and grammar. For example, by replacing masculine generics (e.g., *he*, *man*) with neutral generics (e.g., singular *they*, *he/she*, generic *she*) language reformers challenged the claim they argued was implicit in the use of masculine generics – that men are the typical case of humanity and women, a deviation from this norm. Other 'reform' efforts focused on the coining of new terms to express women's perceptions and experiences, phenomena previously unexpressed in a language encoding a male worldview. For example, innovative terms such as *sexism*, *sexual harassment* and *date rape* were said to be significant in that they gave a name to the experiences of women. As Gloria Steinem (1983: 149) said of these terms: 'A few years ago, they were just called life'.

Limitations to language reform

Beginning in the 1980s, feminist linguistics witnessed a broadening in its conception of sexist linguistic representations, shifting the focus of inquiry beyond single words and expressions to larger units of language and to the way that meanings are negotiated and modified in actual social interactions. That is, early reformers' attention to sexist language at the level of the individual word and the grammar of *he/man* generics gave way to an emphasis on the **gendered nature of linguistic representations in discourse**. This shift in focus was motivated by a number of considerations. First, early non-sexist reform efforts did not always consider the social processes by which linguistic forms, including non-sexist linguistic innovations, are endowed with meaning, particularly when they are used in contexts and communities that remain sexist and androcentric. Second, in restricting one's attention to codified instances of sexist language, as most early proponents of non-sexist language did, instances of linguistic sexism that arise as a result of recurring discursive practices were overlooked.

Because much linguistic sexism exists at the level of interpretive behaviour (Cameron 1992), it cannot be eliminated simply by the prohibition of linguistic forms that deprecate and demean women. In an influential paper that explicated the process by which linguistic forms are endowed with meaning, Sally McConnell-Ginet (1989) showed how **interpretive behaviour** is influenced by the cultural assumptions of interpreters. That is, interlocutors go beyond the linguistic evidence of texts by drawing inferences and such inferences necessarily involve general interpretive principles and the mobilising of extralinguistic contextual factors. In particular, McConnell-Ginet (1988, 1989, 2002) showed how interlocutors' gendered (and sexist) cultural assumptions are an important part of this inferential process. She argues, for example, that an utterance such as 'You think like a woman' functions as an insult in many contexts of Western cultures, not because there is anything in the literal meaning of the utterance that identifies it as an insult, but because the idea that women have questionable intellectual abilities is thought to be a widespread cultural assumption. By contrast, in the context of a community where interlocutors are known to share feminist values, this same utterance could be interpreted as a compliment. As this example makes clear, different interpretations of a single utterance can be a function of the different cultural assumptions that interlocutors bring to bear on the process of meaning-making.

Drawing upon McConnell-Ginet's theoretical framework, Susan Ehrlich and Ruth King (1994) showed that simply introducing **non-sexist terms** (e.g., singular *they*, *he/she*, generic *she*) or terms with **feminist-influenced meanings** (e.g., *sexual harassment*, *date rape*) into a language says nothing about how such terms will be used once they circulate within the wider speech community – especially given the sexist and androcentric values that pervade this larger community. Ehrlich and King considered the fate of non-sexist and feminist linguistic innovations as they moved outside of feminist circles and travelled within the mainstream culture. While such terms ostensibly encoded feminist and non-sexist meanings and indeed signified success for non-sexist language reformers, Ehrlich and King found that these meanings were often lost, depoliticised or reversed as the terms became invested with dominant (sexist) values

and attitudes. In McConnell-Ginet's terms, non-sexist and feminist linguistic innovations, like many words, are relatively empty of meaning and become invested with meaning 'as part and parcel of the shaping and reshaping of social and political practices' (McConnell-Ginet 2002: 149).

The **limitations of non-sexist language reform** were also highlighted by work that focused on the discriminatory nature of recurring discursive features in texts, as opposed to single words and expressions. Kate Clark (1992), for example, documented the pervasiveness of rape reports in the media that obscure the responsibility of male perpetrators and, at the same time, assign blame to female victims by representing them as sexually available. Significant about Clark's findings is the fact that the linguistic features she analysed were not those identified by non-sexist language reformers as problematic. Rather, Clark analysed **recurring naming choices** (e.g., 'pretty blonde divorcee' designating a female victim) and grammatical patterns within clauses (e.g., active vs. passive voice) in order to provide evidence for her claims. Nancy Henley, Michelle Miller and Joanne Beazley (1995) also investigated the role of grammatical forms (i.e., active vs. passive voice) in representations of violence against women. More than just noting their occurrence, however, Henley et al. explored the effects of actives vs. passives on subjects who read mock news reports of violence against women. Specifically, Henley et al. found that when reports of violence against women were represented in passive voice as opposed to active voice, male subjects imputed less harm to the female victim and less responsibility to the male perpetrator. Like much of the experimental work on the negative effects of *he/man* generics, then, this study identified the adverse, real-world effects of certain kinds of linguistic representations. It is important to note, however, that these were not the kinds of representations proscribed by non-sexist style guides.

While the discussion above has shown some of the difficulties involved in simply prohibiting the use of words and expressions that demean and deprecate women, it is not the case that non-sexist language reform should be abandoned altogether. Indeed, in understanding the value of the **feminist critique of language** (Cameron 1998), it is instructive to consider some of the initial theoretical debates surrounding the motivation for non-sexist language reform. Underlying the efforts of language reformers was the idea that language does not simply reflect unequal social relations but also helps to constitute and reproduce them. For many advocates of non-sexist language reform, this idea had its origins in the work of two American anthropological linguists of the early twentieth century – Edward Sapir and Benjamin Whorf. **The Sapir–Whorf hypothesis**, as it is known within the disciplines of linguistics and anthropology, holds that the grammatical and lexical structure of a given language has a powerful mediating influence on the ways that speakers of that language come to view the world [*see* LINGUISTIC RELATIVITY]. The strongest articulation of the Sapir–Whorf hypothesis within the language and gender literature appeared in the work of Dale Spender (1980), who argued that because men have had a 'monopoly on naming', it is their view of the world that is encoded in language.

While the Sapir–Whorf hypothesis is an appealing one and still influential in 'weaker' forms (e.g., Gumperz and Levinson 1995), the 'strong' version of the hypothesis as articulated above has few adherents today. The fact that speakers of a particular language can make conceptual distinctions that their language appears not to allow constitutes a powerful argument against the 'strong' version of the hypothesis. Crystal (1987) cites some Australian Aboriginal languages, for instance, that have few words for numbers: the number lexicon may be restricted to general words such as *all*, *many*, *few* and words for *one* and *two*. Yet it is not the case that speakers of such languages cannot count beyond two nor perform complex numerical operations. In a similar way, if the grammatical and lexical structures of languages were so powerful as to prevent thought or a worldview outside of those structures, then feminist and anti-racist critiques of language would be impossible. In fact, a weaker version of the Sapir–Whorf hypothesis (which has generally come to replace the 'strong' version popular in the mid-part of the twentieth century) suggests that recurrent patterns of language use may predispose speakers to view the world in particular ways, but that such a

worldview is not all-determining. The point here is that speakers *can* 'see through and around the settings' (Halliday 1971: 332) of their language, but to do so may require questioning some of the most basic common sense assumptions encoded in familiar and recurring uses of language. In a sense, then, it is not necessary to subscribe to a 'strong' version of the Sapir–Whorf hypothesis, as many non-sexist language reformers did, in order to think that sexist language is problematic. The feminist critique of language allows for the denaturalising of the somewhat invisible and commonsensical assumptions embedded in sexist language.

S. Eh.

Suggestions for further reading

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Language origins

Since language is a complex rather than a monolithic faculty, we must tackle its evolution by investigating how the various subparts of the faculty might have evolved. It is reasonable to ask what **pre-adaptions for language** might have been present in our primate ancestors, and how these evolved into linguistic features or alternatively, were exapted (i.e. co-opted) for language. One method of investigation is **comparative biology**; if a trait found in humans appears in closely related modern species of non-human primates, then it was probably also present in the last common ancestor of these species. Nonetheless, since no other living species has language, even in some simpler form, we also need to ask what changes have occurred due to evolutionary pressures in the human lineage alone.

Homo sapiens has been anatomically modern for around 150–160,000 years; Neanderthals (*Homo neanderthalis*) coexisted with modern humans for much of that time, becoming extinct between 27 and 35 kya (thousand years ago). We do not know if any species other than *Homo sapiens* had (some form of) language. The fully **syntactic language faculty** is generally regarded as being relatively recent (less than 150,000 years old). In the absence of any direct evidence, inferences concerning complex cognition are sometimes made from the study of pre-historic tools or artwork (e.g., Henshilwood et al. 2004). However, inferring the existence of full (or pre-) language from the archaeological record is highly controversial, and the evidential bases for presumed 'windows' on (or proxies for) language evolution are criticised extensively by Botha (2008, 2009).

There are two distinct views of the **function** (and by extension, origins) **of the earliest forms of language**. The first sees language as evolving 'for' communication; language therefore has many specific adaptations tailored towards expressive needs (Pinker and Bloom 1990; Sampson 1997; Bickerton 2002; Hurford 2002; Jackendoff 2002; Pinker and Jackendoff 2005). The alternative position (Chomsky 1975b; Bickerton 1990; Newmeyer 1991, 2005) is that language evolved for the mental representation of conceptual structure, and thus directly derives from pre-existing cognitive structures, with pressures for more efficient communication coming later. Supporting the former position, Hurford (2002) argues that most of the observed (morpho)syntactic complexities in language have no function other than communication: consider **functional categories**, movement phenomena, linear ordering, case-marking, agreement, binding, even the existence of duality of patterning. On the other hand, Newmeyer (2005: 168) suggests 'a tight linkage between syntactic structure and certain aspects of conceptual structure', continuing: 'The basic categories of reasoning – agents, entities, patients, actions, modalities, and so on – tend to be encoded as elements of grammar'.

There is, though, general agreement that lexical items evolved before a syntactic component. Starting at this level, we can dismiss straightaway the idea that **words** (or protowords) might have

evolved from primate calls (see also Bickerton 2007). First, primate calls are essentially innate, whereas vocabulary items are culturally transmitted (learned). Second, primate vocalisations are largely involuntary, and can neither be suppressed nor produced to order, whereas linguistic utterances are entirely voluntary. Humans also retain a set of ancient, primate **gesture calls** (Burling 1993, 2005); our laughter, crying, screams, etc., share the characteristic features of primate vocalisations. Third, distinct brain regions handle primate vocalisations: neocortical brain structures are not used, whereas these regions are essential for language. Fourth, **primate calls** lack the crucial property of **displacement** (reference to something absent from the immediate physical or temporal context), but instead are prompted by a stimulus such as a threat. Thus, primate calls transmit information inadvertently, whereas language is used intentionally to communicate. Fifth, primate calls are a closed system, as opposed to the open-ended systems of human vocabularies. Sixth, primate vocalisations are made on the inbreath and the outbreath (as are some human gesture calls), whereas linguistic vocalisations use an almost entirely egressive airstream. Seventh, language uses **digital signals** (i.e. discrete phonetic units), whilst most primate calls (including human gesture calls) use **analogue signals** – there is a halfway point between a giggle and a laugh, but no word halfway between *single* and *shingle* (Burling 1993, 2005). Finally, primate calls crucially lack the property of **duality of patterning**, discussed further below. Most commentators, across a wide variety of disciplines, thus agree that the most significant aspects of language do not evolve from primate communication systems (e.g., Bickerton 1990; Cheney and Seyfarth 2005; Burling 2005).

Conversely, aspects of pre-human **cognitive structure** are considered crucial for the origins of the earliest forms of language. Complex conceptual structures are evidently found in other primates, with species closely related to us probably conceptualising the world much as we do, and there are critical continuities between primate cognition and language (see Bickerton 1990; Jackendoff 2002; Burling 2005; Cheney and Seyfarth 2005; Hurford 2007, amongst many others). The importance of social intelligence is stressed by many. For instance, Cheney and Seyfarth (2005: 152–3) note that non-human primates participate in highly intricate social groupings which are rule-governed and which involve dominance hierarchies; the implication is that cognitive structures regulating this information could have been exapted for language. On the other hand, Bickerton (2002; Calvin and Bickerton 2000) stresses the importance of the intelligence required for extractive foraging, and suggests that early **hominins** (i.e. species on the human line of descent) faced distinct pressures from their environment, particularly from predation and as regards their diet. This indicates some selection pressures for the earliest forms of language which were unique to our ancestors, whereas the alternative 'social intelligence' scenarios suffer from the problem that despite their complex social lives, other primate species have not evolved any form of language.

Protolanguage and the development of syntax

Most researchers agree that fully modern language was preceded by a prolonged period involving a more primitive pre-language (Bickerton 1990; Calvin and Bickerton 2000; Jackendoff 1999, 2002: Chapter 8; Wray 2002; Tallerman 2007). This has become known as **protolanguage** (not to be confused with the term in historical linguistics signifying a reconstructed linguistic stage). Most scholars date protolanguage to at least 500 kya (*Homo heidelbergensis*), and possibly as far back as *Homo erectus* or *Homo ergaster*, up to 2 mya (million years ago).

Bickerton (1990) describes a putative structureless protolanguage consisting of short strings of randomly ordered, individual (proto)words, initially with no syntactic properties, and no functional categories. Such protolanguage is compositional, but without subcategorisation, so the (proto)arguments of (proto)verbs would often be absent in unpredictable ways, as in child language (e.g., *put book* vs. *Adam put*). Null elements would be common, but not systematically related to antecedents. In Bickerton's view (1998, 2000), argument structure – the key to full syntax – evolved when **thematic roles** such as *agent*, *patient* and *goal* were exapted by early hominins from their ancient primate usage in a

social calculus. This calculus (e.g., who owes what to whom) enables individuals in complex social networks to keep track of favours, debts and alliances. On this view, the emergence of **full language** from protolanguage relies crucially on an aspect of **social intelligence**.

Bickerton envisages a fairly sharp transition from syntax-free protolanguage to fully syntactic modern language. However, Jackendoff (1999, 2002) proposes a different, gradualist scenario. He discusses various **linguistic fossils** – ancient features surviving in modern languages, such as 'defective' lexical items (*ouch*, *hey*, *shh*, *dammit*, etc.), which lack syntactic relationships. Jackendoff (2002: 249) argues that initial proto-word combinations would not require full syntax, postulating instead pre-syntactic principles which regulated proto-word order and position. **Agent first**, for instance, still surfaces in modern, predominantly subject-initial word orders. **Focus last** (*In the room sat a bear*) is another putative 'fossil principle', as is **grouping**, which ensures that modifiers are next to the word they modify (*dog eat brown mouse* vs. *brown dog eat mouse*). Jackendoff also suggests that an ancient, highly productive method of concatenation is reflected in **noun–noun compounding** in modern languages. The advantage of these principles is that they do not require any syntactic structure, but instead are semantically based. Crucially, they are adaptive because they reduce ambiguity and thus enhance communication.

True syntax can only emerge when purely grammatical elements evolve, the precursors to modern functional elements and grammatical affixes (Bickerton 2000; Jackendoff 2002: Chapters 8 and 9). Most researchers see these as developing via the well-known processes of **grammaticalisation** (e.g., Heine and Kuteva 2002, 2007; see also Comrie and Kuteva 2005). Functional items mark the boundaries of phrases and clauses, so the ability to learn such items is again adaptive, enhancing communicative skills. Hauser et al. (2002) suggest that the central, possibly only, component of the **narrow language faculty** is recursion, a position strenuously denied by Pinker and Jackendoff (2005). Bickerton (in the Appendix to Calvin and Bickerton 2000) sketches another view of the emergence of syntax.

The distant origins of the clause itself, particularly the predicate/argument distinction, are argued by Hurford (2003, 2007) to have their neural basis in pre-human conceptual representations. Hurford also argues that our primate ancestors were well able to form 'protopropositions', which stem from the visual and cognitive ability to keep track of around four separate objects at once; it is thus no coincidence that verbs typically have a maximum of three arguments.

Speech: production and perception

The evolution of language is logically independent from the speech capacity, but since **speech** is the dominant modality in modern humans, we must assume that it was adaptive in its earliest forms; selection pressures only operate on existing features. In contrast to syntax, it is fairly easy to see pre-human antecedents for the motor function of speech (e.g., Studdert-Kennedy 2005: 55–6). The majority of the movements of the articulators clearly stem initially from primate feeding and/or vocal behaviour, and the central characteristics of articulation are therefore exapted from their previous functions.

Certain **physical pre-adaptations** are thought to be important in the production of speech. Amongst primates, humans are unique in having a lowered larynx, a development which made possible the wide range of distinct human vowel sounds. Since form follows function, it is generally assumed that some linguistic vocalisations must already have existed, and further drove the changes to the highly distinctive shape of the supralaryngeal vocal tract. In humans, but not other primates, the vocal tract has a sharp bend, and the forms of our oral and pharyngeal tubes can be varied independently (Hauser and Fitch 2003). The lowering of the larynx is also indirectly linked to bipedalism in hominins, which is therefore another pre-adaptation for language. Independent breathing control, another prerequisite for speech, probably also stems from bipedalism. Again uniquely in humans, neural pathways exist between the neocortex and the vocal folds, explaining in part the voluntary nature of linguistic vocalisation.

In **speech perception**, many features are primitive. For instance, comparative biology

shows that formant perception is a phylogenetically ancient trait, quite probably present in the reptilian ancestor of birds and mammals, where it was likely used to detect the body size of a vocalising animal. Hauser and Fitch (2003) review other such features which are present in a wide range of species, including categorical perception of phonemes. Cheney and Seyfarth (2005) note that although sound production is very constrained in non-human primates, their ability to extract information from the vocalisations of conspecifics and of other animals is highly developed.

Some crucial innovations occurred uniquely in hominins, such as vocal learning and the ability to perform facial and vocal imitation, without which an acquired lexicon is impossible. Imitation may be explained by the discovery in primate brains of **mirror neurons** (Rizzolatti and Arbib 1998), neurons which fire both when an animal performs some action, and when it sees or hears that action performed by another (a conspecific or a human). Mirror neurons were first reported for manual actions such as grasping, but more recently have been discovered for mouth actions (Ferrari et al. 2003). This putative link between mirror neurons and speech imitation lends support to the idea that **vocal babbling** is the crucial development which enables human infants to learn vocal behaviour; see Hurford (2004), Oudeyer (2005: 95–6) for discussion. Syllabic babbling entails practising motor skills, something humans do far more than other primates; practice in general is adaptive because it enables early hominins to cope better with unpredictable or new environments. Speech also requires control over rapid sequences of sounds produced with split-second accuracy. Calvin (2003) proposes that the neural substrate for this behaviour was exapted from the hominin capacity for accurate throwing, another feature absent from other primates.

Neither consonants and vowels nor the features of which they are comprised can be primitives (Studdert-Kennedy 1998, 2005; Studdert-Kennedy and Goldstein 2003), but must derive from more basic structures. There is consensus that **the (proto)syllable**, deriving from primate lip- and tongue-smacks and teeth chatters, is the primary unit for speech (MacNeilage 1998a, 1998b, 2008). Basic motor actions were then paired with phonation to form protosyllables. According to MacNeilage's **frame/content theory**, the syllable frame came first, and was gradually differentiated with variable content as the distinct vocal organs came under voluntary control. Selection pressures here must come from an expanding lexicon: vocabulary can only grow if (proto)lexical items are kept acoustically distinct from one another (see Nowak et al. 1999; also Carstairs-McCarthy 1999 on synonymy-avoidance principles). Lexical growth relies on Abler's (1989) **particulate principle** (Studdert-Kennedy 1998, 2005): a finite set of discrete units can be repeatedly combined in different permutations. Far from being unique to language, the particulate principle (**compositionality**, or Chomsky's **discrete infinity**) is seen throughout the natural sciences, from the genetic code in DNA to chemical compounding. In language, this principle operates on (at least) two levels: forming morphemes from phonological segments, and phrases and sentences from words. Studdert-Kennedy (2005: 53) notes that **duality of patterning** itself therefore derives from an extralinguistic, physical principle.

Another extralinguistic principle, self-organisation – which accounts for natural phenomena as diverse as the formation of snowflakes and the hexagonal cells of honeycomb – seems likely to have been an important property in the evolution of phonological systems, particularly vowel systems (De Boer 2001; Oudeyer 2005, 2006).

The brain and cognition

In physical terms, the human brain has undergone both significant reorganisation as compared to its primate homologues, and also extensive growth, particularly of the prefrontal cortex. It was previously thought that the classical **Broca's and Wernicke's areas** of the neocortex were the 'seat' of language, but this is now known to be false: 'language functions are dependent on the interactions between a number of separated regions within the brain' Deacon (1997: 288); see Lieberman (2000) on distributed processing systems. There are also likely homologues of both Wernicke's and Broca's areas in other primates (e.g., Gannon et al. 1998; Petrides et al. 2005), though evidently

these have no linguistic functions; this implies that these areas were exapted for use in language.

The relationship between our large brains and the language faculty is unknown; did brain growth enable language to evolve, or did an evolving protolanguage drive brain growth? A larger skull certainly presented problems for hominin females, since bipedalism results in a narrowed pelvis, thus more difficult births. An adaptation results: human infants are born underdeveloped, their brains growing dramatically after birth. The ensuing dependent years of infancy are almost certainly crucially involved in the evolution of language, allowing for the possibility of intensive learning (Falk 2004; Locke and Bogin 2006).

In cognitive terms, the similarities and differences between human and non-human primates are hard to quantify. Cheney and Seyfarth (2005) report that the baboon contact bark, given by individuals separated from the group, is only 'answered' if the hearer is also separated – even if the bark comes from their own infant. Cheney and Seyfarth conclude from such observations that monkeys lack a theory of mind (the realisation that other individuals have knowledge and beliefs that may differ from one's own). However, chimpanzees – our closest primate relatives – do show some evidence of understanding what a conspecific does and does not know (Hare et al. 2001; Tomasello et al. 2003). Note, though, that while free-ranging chimpanzees appear rarely to use **pointing**, in contrast, human infants from around twelve months are adept at utilising **referential pointing**, **direction of gaze**, **imitation** and **joint attention** in their interactions with other individuals; such features are considered crucial for the development of linguistic reference (Hurford 2007) and for learning a large, symbolic vocabulary.

Undoubtedly, the evolution of the human use of symbols is a major question in evolutionary linguistics, but much debate surrounds the term 'symbol'; see, for instance, Deacon (1997, 2003) and Bickerton (2003, 2007). While many animals use innately, or can learn, arbitrary correlations between (say) a call and an object, Deacon considers these to be merely arbitrary indices, not symbols. **Arbitrary reference** is not enough to define the uniquely human use of symbols; for Deacon, the most important property of human symbols is that they contract relationships with other symbols, agreed across a community. Although **ape language research** has shown that other primate species are able to learn up to a few hundred human vocabulary items [*see* ANIMALS AND LANGUAGE], their use of these items generally fails to meet the **contractual relationship criterion**; in other words, ape acquired vocabulary has no lexical or syntactic properties, and thus is not human-like. Moreover, no animal remotely approaches human abilities in terms of **vocabulary size**, with human lexicons typically containing at least 50,000 words.

M. T.

Suggestions for further reading

Christiansen, M.H. and Kirby, S. (eds) (2003) *Language Evolution: The States of the Art*, Oxford: Oxford University Press.

Johansson, Sverker (2005) *Origins of Language: Constraints on Hypotheses*, Amsterdam and Philadelphia, Pa.: John Benjamins.

Language pathology and neurolinguistics

Language pathology is a convenient cover term for the study of all aspects of language disorders. As such, it includes the main disciplines involved; namely, medical science (especially neuroanatomy and physiology), psychology (especially neuropsychology and cognitive psychology), linguistics and education. It also covers all categories of disorder, including developmental as well as acquired disorders, disorders that are associated with other deficits, such as hearing impairment or structural abnormality (such as cleft palate) or mental handicap, as well as those that are 'pure' language disorders. It comprises disorders that can be characterised at all levels of language structure and function, from articulatory and auditory speech-signal processing to problems of meaning, and it includes all modalities of language use, in production and comprehension, as represented through such media as speech, writing and signing. Finally, it includes research and all aspects of intervention, from initial

screening and diagnosis, through more extensive assessment procedures, to therapeutic management and remedial teaching.

Thus, many different professions are involved in the field of language pathology, including speech therapy [*see* SPEECH AND LANGUAGE THERAPY], normal and special education, clinical and educational psychology, aphasiology (see below and APHASIA, paediatrics, ear, nose and throat surgery and neurosurgery, audiology and linguistics).

Within this field, certain historical factors have made a lasting impression. **The medical approach** was an early influence in the characterisation of certain aspects of language disorder, particularly in the field of **aphasiology**, which is concerned with acquired disorders associated with neurological damage. Within this approach people having language disorders are regarded as patients, and classification proceeds from the identification of symptoms to a diagnosis in terms of syndromes. **Syndromes** are symptom complexes which have a systematic internal relationship such that the presence of certain symptoms guarantees the presence or absence of certain others.

A further characteristic of the medical approach is the categorisation of language disorders in terms of their aetiology – thus developmental disorders may be linked to difficulties noted with the mother's pregnancy, the delivery, or subsequent childhood illness, such as otitis media or 'glue ear', while acquired disorders may be linked to the site of brain lesions, and the type of brain damage arising from either external sources – gunshot wounds yielding more focal destruction of brain tissue than 'closed head' injuries sustained in road traffic accidents for example – or by diseases such as tumour or degenerative conditions such as Parkinsonism.

The **psychological** approach has also had considerable influence. The tendency here has been coloured by the dominant tradition, but it is possible to discern a consistent emphasis on language as possibly the most accessible, subtle and complex form of overt human behaviour. Disorders in a complex system may provide valuable information on the properties of that system, both in the way that they arise – showing which parts of the system are vulnerable, and how far they may be selectively impaired – and in the sorts of compensatory processes that appear to take place.

A key feature of the behavioural approach has therefore been a concern with psychometric assessment of language functions in relation to other psychological capacities. The early assessments drew largely on intelligence tests, and focused attention on the link between language disorders and impaired psychological functions such as memory and perception. More modern aphasia test batteries, such as the **Boston Diagnostic Aphasia Examination** or the **Western Aphasia Battery**, still contain components that derive from this tradition, such as the requirement to perform simple calculations, and the matching of shapes [*see* APHASIA].

The **linguistic** approach is of more recent origin, based on the methods of structural linguistics developed most completely in the 1930s to 1950s, and on the subsequent trends that derive directly or indirectly from the work of Chomsky. Jakobson is generally regarded as the first to apply the concepts of linguistics to the field of language disorders – he sought a connection between the linguistic characteristics of various disorders and the traditional lesion sites associated with them. In essence, this was the first exercise in what has since become known as **neurolinguistics** (see below). His work was not followed up, however, and what is now referred to as representative of the linguistic approach is a research tradition that has rather distinct origins and characteristics.

The **clinical linguistic** approach may generally be described as one that treats a presenting language disorder as a phenomenon that can be described in linguistic terms, independently of factors such as aetiology and general psychological functions – phonetic, phonological, morphological, syntactic, lexical, semantic and pragmatic, to provide a fairly representative general inventory – and allows for the possibility that any particular case of a language disorder may involve a differential pattern of impairment across some or all of these levels. One implication of this view is the calling into question of the fundamental separation of 'speech' vs. 'language' in the taxonomy of disorders.

The clinical linguistic approach clearly has much to contribute to the appropriate description and interpretation of language disorders,

but there is a general problem regarding the psychological reality of linguistic descriptions and models. For this reason, it is necessary to supplement the clinical linguistic approach by one which attempts to identify the psycholinguistic structures and processes involved in language behaviour, in impaired as well as in normal contexts. This leads us to consider the field of **neurolinguistics**. This term appears frequently to be used for what are, essentially, psycholinguistic studies of neurologically based language disorders. But there is what may be regarded as a more strict interpretation of the term, now briefly reviewed here. **Neurolinguistics** is the study of the relationship between language and its neurological basis. It is convenient to distinguish three general orders of description in the study of language abilities: the linguistic, the psycholinguistic and the neurolinguistic. The first may be represented by the general descriptive approach that recognises such levels of organisation as the phonetic, the phonological, the morphological, the syntactic, the lexical and the semantic and pragmatic; techniques of description at these levels, when applied to the field of language pathology, constitute what we have referred to above as **clinical linguistics**. Alternatively, a rather more integrated system of linguistic description may be attempted, such as is found in the generative tradition [*see* GENERATIVE GRAMMAR].

The second order of description is concerned with the evidence that reveals the nature of the linguistic structures and processes that are actually involved in the use of language – perceptual processes, information-processing strategies, memorial factors and motor-control processes.

The third order of description is concerned with the nature of the neurological operations involved in these psycholinguistic processes; with the structure and function of the auditory system and its associated elements; and with the neural basis for articulatory gestures, and so on.

It is not very easy to understand the relationship between such distinct orders of description, partly because information in all three is still so incomplete. It would be premature to conclude that linguistic properties 'reduce' to, or can be explained by, psycholinguistic properties, and that these in turn can be accounted for in terms of the properties of the neurological substrata of language. For example, it has been observed, within the transformational-syntax tradition, that a number of constraints on the privilege of occurrence of certain syntactic elements may be expressed as a general constraint on movement of such elements – hence a constraint of **subjacency** is proposed to the effect that no constituent may be moved across more than one **bounding node**, a node which acts as a constituent boundary (e.g., NP, S) at a time. The psycholinguistic evidence for the role of subjacency in facilitating the operation of human parsing operations is a controversial matter, however, and the status of subjacency from a strict neurological perspective is difficult even to raise as an issue.

In what sense, then, can there be a neurolinguistics? There are two general answers to this question: the first lies in a general understanding of the neurological organisation of language abilities (what might be called the **neurology of language**); the second is mainly found in the detailed study of language disorders where there is sufficient neurological evidence to allow for some interpretation of the linguistic and psycholinguistic characteristics of the disorder in neurological terms.

An overview of the basic neurology of language may conveniently start with the articulatory system, which has four main components from the point of view of neurological involvement: (1) the **cortex** – the outer layer of so-called 'grey matter' in the brain – where initiating cells located primarily in the **motor strip** make connections with (2) long connecting fibres known as the **upper motor neurons**, which connect to control centres in the **basal ganglia**, **thalamus** and **cerebellum**, and terminate in relay stations in the **brainstem** and **spinal cord**; (3) the **lower motor neurons** which carry signals from the relay stations out to the muscles of the head, neck and chest regions; and finally (4) the muscles served by the lower motor neurons, and which are linked to a sensory feedback loop, to permit monitoring of motor control.

Starting with the first of these components, the relevant part of the cortex is located in the so-called **motor strip**, running anteriorly along the line of the fissures which serve to demarcate the **frontal lobe** in each hemisphere of the

brain. Along this strip, the cells controlling muscles all over the body are organised systematically in such a fashion that those responsible for the lower limbs are located towards the top of the motor strip, while those innervating the muscles of the vocal tract are found at the bottom, close to the junction with the anterior part of the **temporal lobe**. The motor strip cells operate in conjunction with those of the immediately anterior portion of the frontal lobe, the **pre-motor cortex**, which is involved in certain controlling functions, and the **parietal lobe**, posterior to the frontal lobe, also contributes copiously to the upper motor neuron system that connects to the lower control centres.

The very rapid and precise movements of the speech organs require involvement not just of the motor cortex but sensory areas as well. The nervous system appears to function very broadly, therefore, in the control of speech output, through wide subcortical connections in each hemisphere. Each hemisphere is responsible for controlling the complete functioning of the oral tract musculature; thus both left and right sides of the tongue, for example, are controlled from each hemisphere. Such complex behaviour as speech requires consciously willed movements and semiautomatic and completely automatic control of sequences of movements, and it appears that all these aspects are represented in the signals carried by the upper motor neurons as they group together to pass down through the base of the brain. Some, the **cortico-bulbar neurons**, terminate in the brainstem, and others, the **corticospinal neurons**, pass down further into the spinal cord. Still other neurons connect to the basal ganglia and the thalamus; the cerebral cortex is thus able to influence this complex of structures, which in turn influences the brainstem and spinal cord relays.

As consciously willed movements become increasingly automatic, as in the development of speech patterns, they become part of the basal ganglia repertoire. There are both voluntary and postural inputs to the basal ganglia, allowing for the overriding of automatic sequences, and for the integration of information concerning the position of articulators relative to each other in the vocal tract. Part of the function of the cerebellum is bound up in the role of the thalamus and basal ganglia, to regulate postural reflexes and muscle tone – the resistance of muscles to movement.

The **reticular formation**, in the brainstem, is also involved in connections from the upper motor neurons, and appears to exert facilitating and inhibiting effects on certain types of slower-transmitting (or **gamma**) **neurons**, whose function is to help to control the operation of the fast-transmitting (or **alpha**) **fibres**, which are responsible for the movement of the main muscles. This control vs. movement distinction is represented in both the upper and lower neuron systems. Most upper motor neurons diverge within the brainstem, carrying control from each hemisphere to each side of the oral tract.

The connection from the upper to the lower motor neurons marks the division between the **central** and **peripheral nervous systems**. Each lower motor neuron forms part of a **motor unit**, containing in addition the muscle that the lower motor alpha neuron innervates, an associated muscle **spindle**, and a slow-transmitting gamma neuron linked to the reticular formation and cerebellum via the upper/lower motor neuron relay. The spindle carries information on the state of the muscle – extended or contracted – which is used to regulate the innervation of the muscle via the fast-transmitting alpha neuron. The lower motor neurons that are involved in movements of the oral tract connect from relays in the **pons** and **medulla** in the brainstem, and are known anatomically as **cranial nerves** – those conventionally numbered as V, VII, X, XI and XII being the most important – and the **thoratic nerves**, numbered from I to XII, connect from the spinal cord to control the muscles of the ribcage and the abdomen, and thus serve to initiate and regulate the pulmonary airstream mechanism.

If we now pass quickly over the speech signal that is created by the movement of articulators and carried by resultant movement of air particles, we can pick up the process of neurological involvement in speech audition at the point where mechanically boosted signals in the 2–6 kHz speech frequency range are transported to neural impulses in the **organ of Corti**, lying along the **basilar membrane** in the inner ear [*see also* AUDITORY PHONETICS]. The impulses take the form of very brief, all-or-none electrical activity, **action potentials**, travelling along the fibres of

the **auditory nerve** from the **cochlea**. In ways that are still not completely understood, these action potentials carry frequency and amplitude information, as well as duration, to the **cochlea nuclei cells** in the medulla of the brainstem. These cells effectively extract critical features from the auditory nerve signal, by being selectively tuned to respond to different characteristics of the input.

Elsewhere in the medulla, important processing of temporal interactions occurs, which requires a contralateral blending of inputs from both ears. Some medullary neurons respond only to truly synchronous input from each ear, while others are tuned for critical intervals of asynchronous input. Such processing allows for accurate location of the speech signal source in space, and initiates appropriate orientation responses. Fibres from the medullary areas pass through the brainstem bilaterally, with links to the reticular formation and the cerebellum. The **reticular formation** is responsible for relaying sensory input and for readying the cortex as a whole for the arrival of this input. The **cerebellum**, while primarily associated with motor control, has a number of sensory inputs including the auditory and, like the reticular formation, has rich connections with the cortex.

Further complex intermixing of binaural input takes place in the neurons of the **inferior colliculus** in the **midbrain**, some of which are specialised for **ipsilateral** or for **contralateral** input. The major output from here is to an area of the thalamus represented bilaterally as the **medial geniculate body**. This has two-way connections with the cells of the **auditory cortex**, and is thus rather more than simply a further relay station in the auditory system. One of the problems in defining the functions of cells higher up the system is the extent to which their operation is dependent on such higher brain processes as attention, emotion, memory and so on. Likewise, the organisation and function of cells in the auditory cortex is complex and difficult to determine. As in other sensory modalities, the relevant parts of the cortex are organised into a series of **projection fields**, or 'maps' of the relevant parts of the body, in this case the basilar membrane, with one field having primary function.

Thus far, we have not considered the way that language is organised within the brain itself, essentially between the auditory cortex and the motor speech cortex. Functionally, we can think of the cerebral cortex as consisting of four separate but interconnected areas – the frontal, the parietal, the temporal and the occipital lobes, with each of these lobes being represented in the left and right hemispheres (see Figure 1).

Within this structure, the auditory cortex is located on the upper surface of the temporal

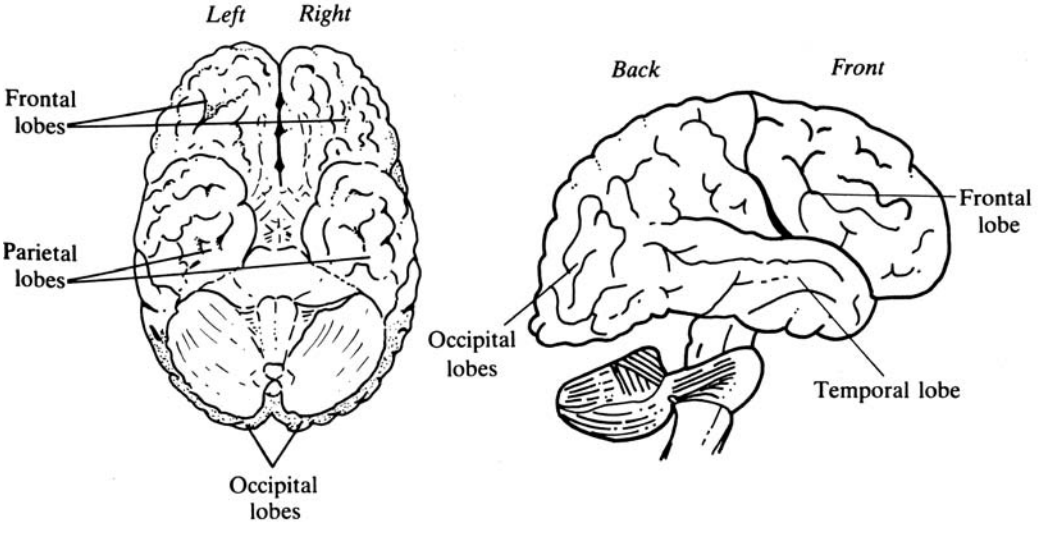

Figure 1

lobe in each hemisphere, close to the junction between the temporal, parietal and frontal lobes. This area is concerned, like the whole auditory system of which it forms a part, with all auditory processing, not just with speech. In most individuals, the left hemisphere is dominant, and this is linked to handedness – left-hemisphere dominance is particularly noticeable in right-handers. The implication of this for speech audition is that the auditory cortex in the left (i.e. normally dominant) hemisphere is more especially involved than the corresponding area on the right; and, because the majority of nerve fibres travel to the auditory cortex contralaterally, this leads to a typical **right-ear advantage** for speech, particularly for stop consonants [*see* ARTICULATORY PHONETICS] that are maximally distinct. This phenomenon has been viewed as evidence for a specialised speech-perception centre in the left hemisphere, but it is not clear that this specialisation is strictly for speech sounds alone.

As far as speech production is concerned, we have noted the area of the cerebral cortex which is represented bilaterally at the base of the so-called motor strip, close to the junction of the frontal, parietal and temporal lobes. This controls the musculature of the lips, tongue, velum, etc. [*see* ARTICULATORY PHONETICS] for both speech and non-speech activities such as blowing and swallowing. Again, the implication of cerebral dominance is that it is normally the left hemisphere that is most closely involved in speech functions, but the issue is not very clear. Generally, it appears that both hemispheres contribute to sensory feedback and motor-control functions in speech as well as non-speech oral-tract activities; the motor nerve fibres are routed from the cortex to the oral tract in bilateral fashion. Nevertheless, dominance is a left-hemisphere characteristic for speech, and it appears that the reason for this may lie in an association between a specialised speech-control centre in the dominant hemisphere and the area of motor cortex devoted to the innervation of oral tract musculature. The function of such a specialised speech processor in production may be primarily bound up in the need for very rapid sequencing of the very precise articulatory movements in speech.

The evidence for hemispherically specialised speech control comes in the main from two remarkable sorts of surgical sources: silver electrode stimulation on the exposed brains of anesthetised but fully conscious patients in cases where precise mapping of the speech area is required prior to surgical intervention, and from so-called 'split brain' patients in whom the left and right hemispheres have been surgically sectioned, resulting in a situation where information that is made available only to the right hemisphere cannot be expressed in speech output, i.e. by the left hemisphere. Much information on the organisation of language in the brain also comes from the study of brain-damaged patients, where, however, the evidence is frequently difficult to interpret as a result of problems in identifying the precise nature of the damage, and the effects of compensatory strategies.

M. A. G.

Suggestions for further reading

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Perkins, W.H. and Kent, R.D. (1986) *Textbook of Functional Anatomy of Speech, Language, and Hearing*, San Diego, Calif.: College-Hill.

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Language surveys

Although there has been commentary on dialectal variation in literature throughout history, as illustrated, for instance, by Caxton's anecdote regarding a northern merchant's use of *egges* in contrast to southern English *eyren* or Chaucer's use of distinctively northern English to indicate the speech of two students, John and Aleyn, in 'The Reeve's Tale', it was not until the emergence of the formal discipline of dialectology [*see* DIALECTOLOGY] in the late nineteenth century that a set of techniques for undertaking surveys of linguistic usage were developed and extensive scholarly work began with the establishment, especially in Europe, of a number of large-scale

'national' surveys. Since that time a large body of literature on the mechanics and requirements of language surveys has built up, and many surveys have been completed.

Early investigations, now often labelled 'traditional dialectology', or 'dialect geography', dealt predominantly with the regional dialects of single languages. They usually involved small samples of informants in several, mainly rural localities and have consequently been criticised as unrepresentative. The principal objective of these early surveys was, however, to capture the 'oldest' and 'broadest' forms of vernacular speech in order to chart the historical evolution of the language under scrutiny, and recently linguists have once again acknowledged the impressive academic achievements of these pioneering studies.

The depth and scope of coverage of subsequent surveys has varied greatly as new lines of enquiry have emerged and different methodologies have been deployed. As a result, language surveys have been used to examine a wider range of aspects of language(s), in terms of the geographical and social constraints placed on selection of speakers for the survey, and in terms of the density of sampling across each population surveyed. In addition to academic studies, language surveys have been carried out for a number of different purposes. The main thrust of official, administrative surveys, such as those that form part of government censuses, has typically been the investigation of actual usage, including bilingualism or bidialectalism and the distribution of functions between the different languages or dialects spoken, the results of which are used to inform government policy. Other surveys have led to the creation of linguistic corpora with a number of diverse applications, from supporting dictionary publication to assisting in the development of computer programs, such as voice recognition software. Several organisations and individuals have also endeavoured to record or document previously uncodified languages, particularly those officially designated as 'minority' or 'endangered' languages. SIL International, for instance, claims to have coordinated linguistic investigations into more than 1,800 languages spoken in more than seventy countries and publishes information about recent surveys online (http://www.sil.org/silesr/indexes/countries.asp).

The features shared by most language surveys are those fairly obviously associated with the selection of informants, data collection and analysis. There is, however, considerable scope for variation in the detailed character of language surveys and the range of formats is perhaps best illustrated by considering the most significant surveys undertaken over the last century or so.

The Deutscher Sprach-Atlas (The German Language Atlas) (1876 to present)

This pioneering survey was conceived by Georg Wenker, who began preliminary work in the 1870s, while employed as a librarian at the University of Marburg. He started by investigating the dialect of his native Rhineland using a questionnaire containing forty-two short sentences. This questionnaire was sent to schools across the area and teachers were asked to provide translations into the local dialect with the help of native-speaking pupils. This method clearly raised concerns about consistency, since teachers would vary a great deal in their ability to reproduce usage accurately, and the system adopted was obviously more suitable for lexis, syntax and morphology than for phonology, with pronunciation merely indicated as faithfully as possible using standard orthography. Nonetheless the 'Dialektcarte der nördlichen Rheinprovinz [Dialect-Map of the Northern Rhine Province]' was published in 1876, followed in 1878 by the 'Sprach-Atlas der Rheinprovinz nördlich der Mosel sowie des Kreises Siegen. [Language-Atlas of the Rhine Province North of the Moselle River and of the District of Siegen]'. The success of this initial exercise led to financial support from the Prussian Ministry of Culture, enabling Wenker to extend the survey to cover the whole of Prussia and, by 1887, the entire German Empire. Later still even German-speaking territories in Central and Eastern Europe were incorporated, as the survey ultimately benefited from the creation of a dedicated Institute within the Prussian State Ministry.

The questionnaire was modified over time, but generally featured variations of roughly forty sentences commonly referred to as ***Wenker-sätze*** (**Wenker sentences**) and by 1939 the data gathering exercise was complete. Questionnaires from over 50,000 localities are now

archived at the Forschungsinstitut Deutscher Sprachatlas ('the German Language Atlas Research Institute') in Marburg and over 500 sound recordings relating to the survey have recently been digitised. One of the survey's most celebrated outcomes is the discovery of the ***Bennrather Linie*** (**Bennrather Line**) – the main isogloss separating Low German from other dialects – and the ***Rheinischer Fächer*** (**the *Rhenish* Fan**) – a pattern of isoglosses that appears to disprove the theory that sound change is uniform. The publication of maps and other materials based on the data has been sporadic, but continued after Wenker's death under the direction of Ferdinand Wrede and Emil Maurmann. One thousand six hundred and eighty-eight hand-drawn, colour maps appeared between 1888 and 1923, a selection of which were reprinted in black and white between 1927 and 1956 and constitute the 'Deutscher Sprachatlas'. A revised version based on a limited set of data was published between 1984 and 1999 as the 'Kleiner Deutscher Sprachatlas [Small German Language Atlas]' and work continues with the ultimate goal of publishing the results of the survey electronically in its entirety through the 'Digitaler [Digital] Wenker-Atlas' project (DiWA http://www.diwa.info).

Atlas linguistique de la France (1897 onwards)

Concern developed in France during the 1880s at the apparently imminent demise of local dialects, prompting Swiss dialectologist, Jules Gilliéron, to undertake an ambitious survey of the relevant varieties. Gilliéron sought to record the same kind of speech and speaker as Wenker and was motivated by a shared interest in contemporary issues in historical linguistics, but his method of fieldwork was radically different. His preferred method of on-the-spot investigation by a trained fieldworker, partly influenced by the perceived urgency of his mission, has been hugely influential in subsequent dialect surveys throughout the world. This decision increased the level of consistency of the data, but inevitably resulted in a significant reduction of the geographical density of the coverage. The fieldwork was collected by a single trained phonetician, Edmond Edmont, who managed to investigate 683 localities in mainland France and Corsica over a period of some fifteen years. Edmont only used one or two informants in each locality, predominantly males lacking in formal education, and worked with a large questionnaire which in its final form elicited 1,900 items from each informant.

The amount of linguistic detail obtained for each locality, the reliability and consistency of the material and the speed of analysis and publication were all an improvement on the corresponding features of Wenker's survey. The results were published throughout the duration of the survey, using material posted back to Gilliéron. Thirteen volumes of maps appeared between 1902 and 1913, constituting the 'Atlas Linguistique de la France'. Two of Gilliéron's students, Karl Jaberg and Jakob Jud, later produced a similar but improved format for their atlas of the Italian-speaking area of Europe (1928–40) and there are now dialect atlases based on this model for a number of European countries, including Spain, Romania, Switzerland and the Scandinavian countries.

Linguistic Survey of India (1894 onwards)

The Linguistic Survey of India was carried out under the supervision of Sir George Grierson, a civil servant who spent much of his life in colonial service in India. The intention was to document every known language and dialect in an area extending from Baluchistan in the west to Assam in the east (the provinces of Madras and Burma and the states of Hyderabad and Mysore were not included after consultation with the local governments). The survey itself consisted of a collection of **specimens** of each language and dialect: a standard passage, a short narrative and a list of test words and sentences. The informants came from a range of backgrounds, reflecting the fact that the aim was to capture long-established literary and prestigious languages alongside minority languages and dialects. The standard passage was a translation into the local language or dialect of the 'Parable of the Prodigal Son',[1] selected by Grierson as it would permit comparative analysis of a number of grammatical features, such as personal pronouns, noun declensions and the present, past

and future tenses. The narrative passage, designed to capture more spontaneous, idiomatic speech required an informant to recount a folk tale or some similar local prose or verse story. This passage was recorded in local orthography (if such existed) and in Roman orthography with a word-for-word interlinear translation into English. Finally the list of test words and sentences ran to 241 items and sought to elicit crucial linguistic elements, such as numerals, pronouns, common nouns (body parts, natural elements, common animals, etc.), common verbs, prepositions, singular and plural forms and comparative and superlative adjectives.

The survey was always intended for both a linguistic and a non-specialist audience and so sound recordings were identified as a desirable supplement to written transcriptions. The first sound recordings were made in 1913 and continued until 1929 and most feature a rendition of the 'Parable of the Prodigal Son'[1], together with a local story or song. Like the main fieldwork, these were generally carried out by officials appointed by the Education Department. The recordings themselves were published by the Gramophone Company of Calcutta and near complete sets are archived at a number of institutions, including the British Library, the School of Oriental and African Studies in London and the Bodleian Library. The India Office Records at the British Library is also home to a substantial archive of uncatalogued correspondence files and original research data relating to the Survey. The results of the Survey, including the various transcriptions of each specimen, were published in eleven volumes in 1927 as 'The Linguistic Survey of India' and a complete set of the sound recordings was digitised in 2007 as a result of collaboration between the Digital South Asia Library and the British Library Sound Archive. In April 2007 the Central Institute of Indian Languages in Mysore announced ambitious plans to conduct a second survey, to be completed by 2017 and divided into two sections: the New Linguistic Survey of India and the Survey of Minor and Endangered Languages.

The Linguistic Atlas Projects (1931 onwards)

A large number of scholars began to work on a projected linguistic atlas of the USA and Canada in 1931. Owing to the huge area to be covered, it was deemed necessary to treat each region as a self-contained unit, and the key role has been that of overall coordinator. This was initially Hans Kurath, who directed the first regional survey in New England, which involved 416 informants in 213 communities providing responses to a questionnaire containing 750 items and was the model for subsequent investigations in other regions. As the survey evolved, tape-recorders became more readily available, to some extent circumventing the problem of the role of the fieldworker in interpreting and recording the responses on site, as analysis could be made later and with greater accuracy on the evidence of a sound recording. Other aspects of the work also represented advances on the European studies; attempts, albeit somewhat haphazard and simplistic by later standards, were made to examine informants of different social and educational levels, and also of different age ranges, since the organisers realised that 'broad' dialect of the type traditionally studied in Europe was of lesser importance in a North American context.

The project has proceeded in a number of regions at different periods – the data for the Upper Midwest was gathered between 1949 and 1962, for instance; that for the Gulf States between 1968 and 1983; and work is still ongoing in some areas, such as the Western States, where work commenced in 1988. In each case the survey has been supervised by a regional director and coordinated centrally at the University of Georgia, with William Kretschmar as the director at the time of this writing. The amount of variability in the data is typically small by comparison with that to be found in Europe, owing to the relatively recent occupation of North America by English speakers, but, particularly in the east, large quantities of interesting material on folk speech and other regionalised usage have been collected. There have been intermittent publications relating to the project, including the following multi-volume publications 'Linguistic Atlas of New England' (1939–43), 'Linguistic Atlas of the Upper Midwest' (1973–6), 'Handbook of the Linguistic Atlas of the Middle and South Atlantic States' (1994) and 'Linguistic Atlas of the Gulf States' (1986–92). The Linguistic Atlas Projects website

(http://us.english.uga.edu/cgi-bin/lapsite.fcgi) gives further information about individual projects by region and, in the case of projects where digitised data are available, this is also accessible online.

The Linguistic Survey of Scotland (1949 Onwards)

The Linguistic Survey of Scotland (LSS) differs from its two British counterparts described below in a number of ways. Firstly, the LSS was broader in scope, dealing with Gaelic as well as English and incorporating fieldwork in Northern Ireland and in the two English counties of Northumberland and Cumberland. It was also more eclectic in its methodology, using varying approaches to suit different kinds of data. The initial stages of the survey, based at the University of Edinburgh, were conducted by means of a postal questionnaire containing 211 items. The vast majority of questions focused on lexis, although there was also a small set of questions concerning idiomatic and/or grammatical usage, and informants were encouraged to supply known variants in other local dialects and additional local vocabulary. The questionnaire also sought information regarding the status of Gaelic within the community and the same questionnaire was used for both Gaelic and English/Scots speaking informants. In 1952 nearly 3,000 questionnaires were sent to primary school headteachers who were asked to find a suitable local informant to complete them. By 1954 1,774 copies had been completed satisfactorily and a second questionnaire containing an additional 207 items was issued to a similar network of localities.

From 1955 onwards a more direct approach was used to elicit phonological information. Trained fieldworkers interviewed one informant in each of 122 localities, including two in England and several in Northern Ireland, but excluding the industrial Central Belt of Scotland and the part of Scotland defined by the investigators as west of the Highland Line. The phonological questionnaire contained 1,039 items – monosyllabic core words featuring target vowels in a variety of phonetic environments in both citation form and within test sentences. The results of the English/Scots section were published in three volumes between 1975 and 1986 as 'The Linguistic Atlas of Scotland: Scots Section'. The Gaelic section of the survey lagged behind, but the results were finally published between 1994 and 1997 in five volumes as 'Survey of the Gaelic Dialects of Scotland: Questionnaire Materials Gathered for the Linguistic Survey of Scotland'.

The Survey of English Dialects (1950 onwards)

Systematic work on the dialects of England began at a relatively late date compared with surveys in other European countries. The notion of a linguistic survey took root in the 1930s, but initial attempts were interrupted by the outbreak of the Second World War. After the ceasing of hostilities Harold Orton, working in the Department of English Language and Medieval English Literature at The University of Leeds, and Eugen Dieth, Professor of English Language at the University of Zurich, conducted a series of pilot studies to establish methodology, before settling on a questionnaire containing 1,300 questions as the basis of a nationwide survey. Having finalised details of the questionnaire, published in its entirety in 'Survey of English Dialects: An Introduction' (1962), a team of fieldworkers was assembled and data were collected in a network of 313 localities over an eleven-year period from 1950 to 1961. The focus was intentionally on isolated rural communities with historically stable populations, although urban areas were intended for inclusion later, a plan that had to be abandoned on economic grounds. The criteria for selecting informants were also crucial and in most cases two or three informants were used, with priority given to older males from families with a long-established presence in the community.

The responses to the questionnaire itself were recorded using a narrow phonetic script by individual fieldworkers who had received training under the guidance of Harold Orton and the raw data gathered by the fieldworkers was published between 1962 and 1971 in four volumes (each in three parts) entitled 'Survey of English Dialects: The Basic Material, Vols. I–IV'. The material contained within these volumes continues to be used by social and historical linguists

worldwide and has led to a number of dedicated publications, most notably, 'The Linguistic Atlas of England' (Orton et al. 1978) and 'Survey of English Dialects: The Dictionary and Grammar' (Upton et al. 1994). Advances in audio technology during the 1950s made it increasingly possible, and indeed desirable, to record informal conversations on site. Several localities were revisited to make sound recordings with original contributors or replacements with similar profiles, a process that continued until 1974. Interviews were unscripted and unrehearsed, encouraging speakers to use their normal speech forms and these sound recordings were used to resolve discrepancies between individual interpretations of difficult phonological issues. The original fieldworker's notebooks, open reel tapes and gramophone discs are held at The Leeds Archive of Vernacular Culture and digital copies of the sound recordings are also held at The British Library Sound Archive. The Survey of English Dialects (SED) remains a rich source of information: the 'Incidental Material' was published as recently as 2003 (http://www.leeds.ac.uk/english/activities/lavc/IMdocs.htm); extracts from 288 of the 313 localities have recently been made available online at http://www.bl.uk/sounds; many contemporary studies cite SED data as a baseline; and Leeds University continues as a centre of dialect studies.

The Survey of Anglo-Welsh Dialects (1968 onwards)

The Survey of Anglo-Welsh Dialects (SAWD) was directed from 1968 until his retirement in 1995 by David Parry, of the Department of English Language and Literature at the University of Swansea. Parry had previously conducted fieldwork for Orton's Survey of English Dialects (SED) and the SAWD methodology bears many of the hallmarks of its predecessor. For the first, rural phase of SAWD, fieldworkers used a questionnaire closely resembling the one prepared for the SED and elderly informants throughout rural Wales were interviewed and tape-recorded in a network of ninety localities. Work was quickly completed in the south, but fluctuating levels of financial support meant that it took some time to extend coverage to include north Wales, where fieldwork also proved more demanding as many informants were bilingual English–Welsh speakers with Welsh as their mother tongue. Nonetheless the Survey was finally completed and the results published in three companion volumes, *The Survey of Anglo-Welsh Dialects*, *Volume I: The South-East* (1977), *The Survey of Anglo-Welsh Dialects*, *Volume II: The South-West* (1979) and *The Anglo-Welsh Dialects of North Wales* (1999).

Work continued during the 1980s in an attempt to investigate speech in more densely populated areas that had been beyond the scope of the initial survey, such as the Rhondda. Later still a number of urban areas, including Cardiff, Swansea and Wrexham were visited and investigated by Robert Penhallurick using a newly created questionnaire and a more sociolinguistic methodology in interviews with young, middle-aged and elderly informants. Sound recordings were made in many of the SAWD localities and in all of the later survey sites, and digital copies have been deposited at the British Library. Extracts from a small selection of the SAWD recordings will be available online from 2008 (http://www.bl.uk/learning/langlit/sounds/index.html) alongside a small set of SED recordings.

Sociolinguistic surveys (1960s onwards)

Much recent academic fieldwork has placed an increasing emphasis on investigating social, rather than (or occasionally as well as) geographical, variation. Influenced by researchers such as William Labov, the purpose of many surveys towards the end of the twentieth century has been to establish the mechanics of linguistic variation according to a number of social factors, such as the age, gender, ethnic, cultural and/or socio-economic status of speakers within the same speech community. This kind of survey requires large numbers of informants from a variety of backgrounds within a given speech community – often a single urban location. Unlike traditional dialect surveys, which seek to record a large sample of the lexis, grammar and phonology of a chosen variety, surveys in the Labovian tradition concentrate on a few selected linguistic features that are known to exhibit significant variation within a given speech community. The variation in a speaker's use of the selected feature(s) is correlated with social

variables, such as age, gender and social class, or with context or setting, such as the formality or informality of the speech act. This method of investigation, often referred to as '**urban dialectology**' [*see* DIALECTOLOGY], is also frequently concerned with speakers' attitudes to language variation and people's awareness of and feelings towards certain features of their local variety. Studies in this tradition have contributed greatly to our understanding of the social significance of linguistic variation and have been particularly influential in raising awareness in educational circles of the need for sensitivity towards variation in a learning environment.

Labov's classic study of New York City, published in 1966, sought to prove that the presence or absence of postvocalic /r/ in New York speech, which linguists had generally assumed to be an example of random variation, was in fact systematic. Around 100 informants were used, sampled according to criteria used for an earlier sociological survey. Interviews with informants elicited continuous speech in the form of responses to an interviewer's questions, but also included a short reading passage, a word list and a set of minimal pairs. Quantifying the differing levels of postvocalic /r/ used by different social groups in different speech acts revealed a number of aspects of sociolinguistic stratification and confirmed that postvocalic /r/ was in fact socially and linguistically significant in New York. Speakers in the highest socio-economic group were shown to pronounce postvocalic /r/ more frequently than speakers in lower socioeconomic groups, while speakers in all groups showed an increase in use in formal speech compared with conversational style. This survey established a number of principles and prompted subsequent researchers to refine the model to examine a variety of linguistic notions. Among the most notable studies in this tradition are Labov's later survey of speech in Martha's Vineyard (Labov 1972a), Trudgill's study of Norwich (Trudgill 1974), Milroy's work in Belfast (Milroy 1980), Horvath's investigation in Sydney (Horvath 1985), Eckert's 'Jocks and Burnouts' study (Eckert 1989) and Williams and Kerswill's investigation into new dialect formation in Milton Keynes (Williams and Kerswill 1999).

More recently attempts have been made on both sides of the Atlantic to incorporate contemporary sociolinguistic methodology into large-scale surveys. In the early 1990s, a team of researchers in the USA led by William Labov, Sharon Ash and Charles Boberg conducted a nationwide telephone survey (**TELSUR**) involving local speakers from all the urban areas of the USA and Canada in an attempt to chart the regional dialects of American English on the basis of changes in progress. The TELSUR interviews were carried out between 1992 and 1999 and included a passage of spontaneous speech prompted by a discussion of recent developments in the city; a sequence of common words; a set of minimal pairs in the form of judgements on potential rhymes, such as 'hot' versus 'caught'; responses to the validity of certain grammatical constructions; and questions relating to a small number of lexical items, such as 'what do you call a large piece of furniture that seats three people?' Respondents were also asked to continue participation by reading a word list that was mailed to them after the initial interview. The data derived from TELSUR led to the publication in 2006 of a book, CD-ROM and website, the '**Atlas of North American English: Phonetics, Phonology and Sound Change**' (http://www.ling.upenn.edu/phonoatlas/) that features a variety of articles, maps and sound samples.

In 2005, the **BBC Voices survey** (http://www.bbc.co.uk/voices) set out to capture how we speak today by encouraging members of the public to contribute to an online survey of the languages, words and accents they use, their styles of talk and their attitudes to language. BBC Local Radio also recorded over 300 group conversations involving a total of 1,297 people across the whole of the UK (mainly in English, but also in Scots, Ulster Scots, Welsh, Irish, Scots Gaelic, Manx and Guernsey French). In order to ensure the recorded conversations were comparable, every conversation followed the same loose structure and used the same set of prompts. The overall goal was to capture relaxed, unselfconscious conversation within the group in as natural an environment as possible, with minimal interference from the interviewer. In advance of the meeting, each interviewee was sent the same set of common words set out in a **spidergram** – words such as 'grandmother', 'toilet', 'drunk', 'alley' and so on – and asked to

think in advance about what other terms they might use for each one. In the meeting itself, the interviewer used the list as a starting point to explore whether alternative words existed, and in what circumstances they might be used. Interviewers also explored words and phrases specific to the group itself, by initiating conversation about the place they came from, their work, or their shared interest and quizzed the interviewees about their attitudes to language [*see* ATTITUDES TO LANGUAGE]. This interview technique draws on the methodology employed from the late 1990s onwards in the **Survey of Regional English (SuRE**), a project directed by Clive Upton at the University of Leeds. The **spidergram** is based on the **Sense Relation Network sheets** designed by Carmen Llamas (1999) and used in comprehensive SuRE fieldwork in Middlesbrough, Sunderland, the Black Country and Southampton.

J. R.

Notes

1 This passage was clearly popular among linguists at the time as it was used in a number of other investigations, most notably by Wilhelm Doegen , who made several hundred ethnographic and linguistic sound recordings using Prisoners of War from all over the world in captivity on German soil between 1916 and 1918.

Suggestions for further reading

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Language universals

By **language universal** is usually meant a generalisation describing a pattern that is assumed to be valid, at least in principle, for all human languages. While this is a general definition compatible with all of the ways in which the notion of the language universal has been used in the linguistic literature, this notion has very different senses in the two theoretical approaches that deal with language universals, the **typological approach** that originated from the work of Joseph Greenberg (particularly Greenberg 1963) [*see* LINGUISTIC TYPOLOGY] and **generative grammar** [*see* GENERATIVE GRAMMAR] and its offspring.

In the typological approach, the idea that there are patterns valid for all languages originates from the empirical observation that different languages display the same grammatical phenomena, either in the sense that these languages all display a particular grammatical feature, or in the sense that, for all languages that have a particular grammatical feature, this feature is always associated with some other feature. These patterns are regarded as universal to the extent that they can reasonably be assumed to be valid for all of the world's languages, or a statistically significant percentage thereof, and to originate from some principle pertaining to the nature of language in general (and not, for example, from the fact that the relevant languages have inherited the pattern from a common ancestor, or acquired it through borrowing).

Universals in this sense will henceforth be referred to as **typological universals**, and they are of two types, **non-implicational universals** and **implicational universals**. Non-implicational universals concern the distribution of single grammatical features. A classical example of this is the fact that all languages have vowels. Implicational universals concern correlations between different features such that all languages that have a feature X also have a feature Y. Such correlations are implicational

relationships between logically independent grammatical features, and can therefore be formulated as logical implications of the form X → Y. These cover four logically possible types: X & Y, ~X & Y, ~X & ~Y, and X & ~Y. Of these, the former three types are allowed by the implication, while the fourth is excluded. Any implicational relationship between logically independent grammatical features can thus be stated as a logical implication formulated in such a way that the types attested in the world's languages correspond to those allowed by the implication, while the unattested types are excluded by the implication. For example, there appears to be a correlation between the order of noun and relative clause and the order of object and verb, such that, for all languages where the relative clause precedes the noun, the object precedes the verb.

This can be stated as a logical implication of the form RelN → OV, where Rel, N, O, and V are the standard typological labels for relative clause, noun, object, and verb, respectively. This implication allows for the three attested types RelN & OV, NRel & VO, NRel & VO, and excludes the unattested type RelN & VO (Dryer 2007).

While non-implicational universals are relatively rare, a considerable body of evidence has been accumulated over the past decades for implicational universals in phonology and morphosyntax. These universals pertain to a wide variety of grammatical domains, including, for example, word order, alignment patterns, parts of speech, animacy, and grammatical relations; a detailed discussion of the relevant issues can be found in a number of standard textbooks in typology, such as Comrie (1989), Whaley (1997), Song (2001) and Croft (2003), as well as in other reference literature such as the papers collected in Haspelmath et al. (2001), Mairal and Gil (2006), and Schachter and Shopen (2007). Many of the relevant grammatical phenomena involve multiple implicational relationships between different grammatical features, such that the same feature is simultaneously the consequent of an implication and the antecedent of another. This yields **chains of implications** of the form A → B & B → C & … These chains go under the name of **implicational hierarchies**, and, in the current typological practice, they are usually written as … C > B > A, where the presence of any term implies the presence of all of the terms to the left. Perhaps the best-known example of an implicational hierarchy is Keenan and Comrie's (1977) **Accessibility Hierarchy** for relativisation, which describes a number of implicational relationships between different syntactic roles (such as, for example, subject, direct object, and indirect object) with regard to the possibility for a language to form relative clauses on these roles.

Universals in generatively oriented approaches differ from typological universals in that they are conceived as components of a speaker's mental grammar whose existence follows from specific theoretical assumptions about language acquisition, rather than from any attested cross-linguistic pattern. Since the primary linguistic data available to the language learner is argued to be largely insufficient to construct the target grammar, an innate pre-specification of the brain is postulated which makes language acquisition possible [*see* LANGUAGE ACQUISITION]. This prespecification, which goes under the name of **Universal Grammar**, includes a representation of the range of possible human grammars, from which the language learner selects a target grammar in response to the linguistic data to which they are exposed. As the components of this representation are arguably shared by all speakers, they represent universals of language (Boeckx 2006, among many others).

Assumptions about what components exactly are part of the representation have evolved over time, as has the notion of Universal Grammar itself, and different authors postulate different sets of components (see Jackendoff 2002, Chapter 4 for a comprehensive review of the relevant issues).

In earlier versions of generative grammar, the components include a number of grammatical elements that represent the building blocks of linguistic structure, such as, for example, phonological distinctive features in phonology, or part of speech categories and the notion of syntactic tree in syntax, as well as rules and constraints that have to be present in a grammar, e.g., phrasal formation rules, derivation rules, and constraints thereon (these two types of properties were originally referred to as substantive and formal universals, respectively).

Later versions of generative grammar, as well as other generatively oriented approaches such as Optimality Theory [*see* OPTIMALITY THEORY], also posit a number of devices that yield the range of possible variation found in the world's languages.

For example, in the **Principles and Parameters approach** (Chomsky 1981, 1995), Universal Grammar is assumed to include a specification of a number of universal principles, each associated with an open value parameter. Individual parameters may have different values in different languages, which are triggered by the linguistic input to which the language learner is exposed. Interaction between the universal principles, the open value parameters and the input makes it possible for the learner to acquire the target grammar. A classical example of this is provided by the **head parameter**. The head parameter is associated with **X-bar theory** (Chomsky 1981), a theory of syntax assuming a universal principle whereby a phrase always contains a head of the same lexical category (a noun, verb or preposition) along with possible complements. The head parameter distinguishes between languages in which complements follow the head, such as English, and languages where complements precede the head, such as Japanese. Depending on the external linguistic input they receive, the language learner selects the value 'head-initial' or 'head-final' for the target language (Fukui 1995, Ouhalla 1999, among many others).

A comparable model for cross-linguistic variation is provided in Optimality Theory (Kager 1999, among others). In this model, possible grammatical structures are licensed by competing constraints that are represented in a speaker's mental grammar. The various constraints are universal, but they are ranked differently in different languages. The structures found in individual languages result from the action of an **Evaluator component** of the grammar, which evaluates a range of structures corresponding to different constraints, and selects the optimal structure with respect to the ranking of constraints in the language.

The two senses in which the notion of language universal is used in the typological approach and in generatively oriented approaches have different theoretical and methodological implications.

For example, since typological universals are empirically observed patterns, in order for a particular pattern to be regarded as a typological universal it must be manifested in a statistically significant number of languages. As a result, the typological approach is crucially concerned with cross-linguistic comparison and related questions, such as selecting statistically representative language samples (see Cysouw 2005 for a review of this issue) and defining the object of investigation so as to make sure that one is actually comparing the same entities across languages (Croft 2003, Chapter 1, among others).

This is in contrast to generatively oriented approaches, where universals can be posited independently of cross-linguistic comparison. The rationale behind this is that, if it can be demonstrated that a particular linguistic property is not learned, that property has to be part of the innate endowment of the language learner, independently of whether or not it is manifested across different languages. Arguments for the innate status of a particular property usually include the fact that the property is so abstract or complex that it could not be learned inductively, the fact that the property appears at an extremely early stage of child development, and the fact that the property cannot plausibly be reconducted to any aspect of the external input received by the language learner (Newmeyer 1998: 85).

This view has resulted in a tendency to establish universals on the basis of in-depth investigation of one or few languages only, rather than the broad-range language samples used in the typological approach. This tendency is particularly evident in earlier versions of generative grammar, but it has continued even after the importance of cross-linguistic comparison was emphasised in the Principles and Parameters theory. For example, the cross-linguistic studies presented in Baker 2001 and 2003 are based on only a dozen languages, selected on the basis of their structural diversity rather than any particular systematic sampling criterion.

Another consequence of this view is that, contrary to typological universals, universals in generatively oriented approaches need not be manifested in all languages (or in a statistically significant number of languages). If particular

linguistic properties are not learned, then they must be pre-specified in a learner's mind even if they are not manifested in the target grammar, because otherwise learners could not fully acquire the grammars in which they are manifested. As a result, the whole range of options that are possible for a grammar and are not learned must be pre-specified in a learner's mind. Insofar as they are pre-specified for all learners, these options are universals of language, but they may not be implemented in the grammar of particular languages. For example, as far as the head parameter is concerned, the value 'head-final' is pre-specified in a learner's mind, because the learner must know that languages may be either head-initial or head-final, but this value will not be manifested in head-initial languages.

The different nature of universals in generatively oriented approaches and in the typological approach also has consequences for the explanations that are proposed for the very existence of individual universals.

In generatively oriented approaches, the idea that universals are components of a speaker's linguistic knowledge provides a direct explanation for the existence of individual universals, in that it is basically assumed that the reason why individual universals exist is that they correspond to constraints in a speaker's mental grammar that license languages having the properties involved in the universal, and disallow languages having no such properties.

In the typological approach, no particular assumption is made as to the status of universals in terms of a speaker's linguistic knowledge. This means that individual universals may be accounted for independently of this knowledge. In fact, typological universals are usually accounted for in terms of a variety of principles that pertain to the function of linguistic expressions. By **function** is meant here, following the standard practice in the typological literature, either the semantic and pragmatic content of a particular expression, or the use, acquisition and processing of that expression (these two senses are sometimes referred to as internal vs. external function, respectively: Croft 1995).

Thus, for example, the overwhelming cross-linguistic preference for **protasis-apodosis** (rather than apodosis-protasis) clausal order in conditional sentences (that is, the conditional in an if-then sentence comes before the consequent: 'If it is raining, we shall get wet' is more common than 'We shall get wet if it is raining') has been argued to originate from the fact that this order reflects the conceptual relationship between the events encoded by protasis and apodosis, in that the event encoded by the protasis is the condition for the event encoded by the apodosis, and is therefore logically prior (Greenberg 1963; Haiman 1978). This explanation is based on a general idea that linguistic expressions are organised in terms of **diagrammatic iconicity**, that is, the relationship between the structural components of individual expressions diagrammatically reflects the relationship between the concepts encoded by these expressions (Haiman 1983 and 1985a; Newmeyer 1992 and 1998; Croft 2003).

Other typological universals have been accounted for in terms of the use frequency of the relevant expressions. For example, recurrent cross-linguistic asymmetries exist in the distribution of overt marking for different values of the same grammatical category, e.g., for the category of number, singular vs. plural or dual. If the values that are more frequent at the discourse level, such as singular, are encoded by overt morphology, then so are the values that are less frequent at the discourse level, such as plural or dual. This is presumably due to **economy**, a principle whereby speakers tend to minimise the length or complexity of any given message. Economy leads speakers not to use overt marking when they can avoid doing so, and, since more frequent values are easier to identify, they do not need to be indicated by means of overt marking (Croft 2003).

Yet other typological universals have been accounted for in terms of processing ease. For example, Keenan's and Comrie's Accessibility Hierarchy for relativisation shows that subject and object are the syntactic roles most accessible to relativisation. This has been argued to originate from the fact that the relative clauses formed on these roles are easier to process than those formed on other roles (Keenan and Comrie 1977). Similar arguments have been brought to account for certain word order correlations. For example, there is a correlation between the order of possessor and possessee

and that of object and verb. This correlation has been argued to be motivated by processing ease insofar as it determines phrase structure configurations that are easier to process (in terms of the amount of linguistic material that must be processed before the immediate constituents of a phrase can be recognised: Hawkins 1994 and 2004).

The various principles that are invoked to account for typological universals are generally assumed to operate at the **diachronic** (historical), rather than the **synchronic** (momentary) level. Diachronically, these principles give rise to particular constructions in individual languages. Synchronically, however, speakers acquire and use these constructions because they are conventional in the language (or are transmitted from one speaker to another anyway), not because of the principles that gave rise to the construction in the first place (Croft 2000, Dryer 2006a, among others). This too is in contrast with generatively oriented approaches, where the fact that universals correspond to constraints in a speaker's mental grammar means that a speaker's acquisition and use of the relevant constructions is motivated in terms of these constraints, and therefore these constraints play a direct role at the synchronic level.

Because of the differences between typological universals and universals in generatively oriented approaches, the two may be thought of as entirely distinct entities. Typological universals are patterns that can be observed in a statistically significant number of languages, but may have no direct match in a speaker's mental grammar. For example, the cross-linguistic preference for protasis-apodosis order may be the result of an iconic principle that leads to the creation of conditional sentences with this order in individual languages, but there may not be any constraint in a speaker's mental grammar stating that, for all human languages, the protasis must precede the apodosis in conditional sentences. Conversely, in generatively oriented approaches, universals correspond to constraints in a speaker's mental grammar that may have no direct match in any attested cross-linguistic pattern. For example, the fact that there is a head parameter with different possible values has no direct correlate in the grammatical patterns that can be observed in the world's languages, because only one of the possible values is implemented in individual languages.

These facts suggest that the inventory of typological universals may not overlap with the inventory of universals posited in generatively oriented approaches. Nevertheless, a number of generatively oriented models have been put forward over the decades in which a speaker's mental grammar includes devices that yield exactly the patterns described by typological universals, particularly implicational ones.

For example, typological research has discovered two-way implicational correlations between particular word order patterns, e.g., between the order of adposition and noun and the order of possessor and possessee. Presence of prepositions implies that possessees precede possessors, and the fact that possesses precede possessors implies that the language has prepositions. Conversely, presence of postpositions implies that possessees follow possessors, and the fact that possesses follow possessors implies that the language has postpositions. In logical terms, this can be indicated as NG $\leftrightarrow$ Prep or GN $\leftrightarrow$ Postp, where N, G, Postp, and Prep are the standard labels for possessee, possessor, postpositions, and prepositions, respectively (Dryer 2007, among many others). In the Principles and Parameters approach, these correlations have been argued to originate from specific parameter settings that determine the presence of clusters of features in the language, e.g., 'head-first' determines the presence of possessee-possessor order and prepositions, while 'head-last' yields the mirror pattern with possessor-possessee order and postpositions (see, for example, Ouhalla 1999: 297–302).

In addition, implicational relationships between parameter settings have been posited that are argued to yield one-way implicational correlations of the type dealt with in terms of typological universals. For example, Baker (2001) argues that implicational relationships exist between various parameters (head directionality, topic prominence, ergativity, verb attraction, verb serialisation, and subject placement), such that a specific setting for a parameter X implies specific settings for other parameters that are hierarchically dependent on X. In Baker's view, the implicational relations between the settings of the various parameters

limit the number of decisions a language learner has to make, and the fewer such decisions, the more frequent the language type will be.

Working in an Optimality-Theory framework, Aissen (1999, 2003) also proposes a model for handling the hierarchies discovered by typological research by postulating that these hierarchies originate from constraints in a speaker's mental grammar. Aissen specifically addresses the hierarchies pertaining to the mapping of particular arguments onto subject roles and the presence vs. absence of case marking for direct objects. Aissen posits a number of constraints in a speaker's mental grammar that penalise the presence of the relevant phenomenon, e.g., case-marked objects, and competing constraints that penalise the absence of this phenomenon, e.g., objects not marked for case. The various language types allowed by the hierarchies originate from different rankings of these two types of constraints for the various points on the hierarchies. For example, if a language uses case marking for human objects and nonhuman animate objects, but not for inanimate objects, this means that the constraint against having case-marked objects is outranked by that against not having them for human and nonhuman animate objects, while the latter constraint outranks the former for inanimate objects. Aissen further assumes that the various contexts in which the relevant phenomena can occur are linked by hierarchical relationships that are also represented in a speaker's mental grammar. These relationships yield implicational patterns for the distribution of the relevant phenomena across different contexts, as described by the typological hierarchies. For example, human objects outrank nonhuman animate objects and inanimate objects, and this ensures that, if case marking is used for inanimate objects, then it is used for nonhuman animate objects and human objects.

Attempts to account for typological universals in terms of constraints in a speaker's mental grammar have however been argued to be problematic in two major respects (Newmeyer 1998, 2004, 2005; Haspelmath 2004; Cristofaro 2009).

First, most typological universals have exceptions. This is natural, indeed expected in the typological approach, because in this approach the cross-linguistic distribution of particular patterns is a function of the principles motivating that pattern (e.g., economy or iconicity) as opposed to other principles, which may give rise to different patterns (Du Bois 1985 and 1987; Croft 2003). Thus, typological universals reflect the probability of particular language states arising, rather than possible vs. impossible language types. Lower probability language states may occasionally arise in a language, which leads to exceptions to individual universals (Dryer 1997b; Croft 2003: Chapter 8). For example, it has been argued that at least some of the instances of the two-way correlation between the order of adposition and noun and the order of possessor and possessee can be accounted for in terms of a diachronic process whereby adpositional constructions originate from the grammaticalisation of possessive constructions and maintain the original order of the latter (Bybee 1988). This principle is limited in its scope, in that there may be other competing grammaticalisation processes leading to the development of adpositional constructions from sources other than possessive constructions (Dryer 2006a). In this case, exceptions to the word order correlation pattern between adpositional constructions and possessive constructions may arise.

Exceptions to individual universals are however difficult to account for if one assumes that these universals originate from constraints in a speaker's mental grammar that license or disallow particular patterns for all languages. Since by definition these constraints should always work in the same way, there appears to be no obvious and non-ad hoc way to account for the fact that exceptions to the relevant patterns may arise in individual languages.

A more general problem with the idea that typological universals originate from constraints in a speaker's mental grammar is that there appears to be no obvious motivation for this idea in the first place. In the typological approach, the reason why different languages obey the same patterns is that these patterns originate from functional principles that play a role in all of these languages. This provides in many cases an exhaustive explanation for the cross-linguistic patterns, to the point that even generatively oriented linguists recognise that functional principles might have contributed to shaping

Universal Grammar (see, for example, the discussion of Chomsky 1981 in Newmeyer 1998: 154–7, as well as the review of the different positions on this issue in Kirby 1999: Chapter 5). These principles play a direct role in generatively oriented theories such as Optimality Theory and the **Iterated Learning Model** (Kirby 1999; Kirby et al. 2004). If one assumes that functional factors may have played a role in the shaping of language universals, then there is no obvious need to postulate further explanatory principles for individual universals in the form of constraints that are specifically represented in a speaker's mental grammar.

Because of these problems, many linguists maintain the position that typological universals should be kept distinct from hypotheses about Universal Grammar and a speaker's mental grammar in general (Croft 1998; Newmeyer 2004, 2005; Haspelmath 2004; Dryer 2006b).

S. C.

Suggestions for further reading

Boeckx, C. (2006) 'Universals in a Generative Setting', in R. Mairal and J. Gil (eds), *Linguistic Universals*, Cambridge: Cambridge University Press.

Comrie, B. (1989) *Language Universals and Linguistic Typology: Syntax and Morphology*, 2nd edn, Oxford: Basil Blackwell.

Croft, W. (2003) *Typology and Universals*, 2nd edn, Cambridge: Cambridge University Press.

Newmeyer, F.J. (2005) *Possible and Probable Languages: A Generative Perspective on Linguistic Typology*, Oxford: Oxford University Press.

Lexicography

What is a dictionary?

Lexicographers produce lexically oriented reference works of several types, e.g., **dictionaries**, **thesauruses** and **glossaries**, but this article deals with their most typical product: dictionaries. The word *dictionary* has been used in the name of almost every sort of book in alphabetical order, including many encyclopedias. However, a **lexicographic dictionary** is one that provides **lexically relevant information**, e.g., pronunciation and meaning, about **lexically relevant units**, e.g., words. These lexically relevant units are displayed in a **macrostructure** that is a succession of independent articles (**entries**), so ordered that any article may be found through an explicitly statable search procedure (an **algorithm**). The typical **dictionary algorithm** (which in English and many other languages is alphabetical order) is based on the written form of the lexically relevant units rather than on their meaning, and the typical dictionary entry is **semasiological** – that is, going from name to notion. By contrast, the typical thesaurus entry is **onomasiological** – that is, going from notion to name.

Lexically relevant units in dictionaries

The best-known type of lexically relevant unit is the lexical unit. A **lexical unit** is a constituent unit of the **lexical system**, the **vocabulary**, of a language; and the best-known type of lexical unit is the **word** [*see* MORPHOLOGY]. A lexical unit, a **lexeme**, is a set of units of form, **morphemes**, that represents a set of units of content, **sememes**. The morphemic representation of a lexical unit is realised in writing by one or more sets of **graphical units** or **graphemes**, such as letters, and in speech by one or more sets of **phonological units** or **phonemes** [*see* PHONEMICS]. The relation between form and content can best be understood as a correspondence or mapping. Table 1 shows what mappings can occur.

As shown in Table 1, *encyclop(a)edia* and *'controversy/con'troversy* are one lexical unit apiece despite the variability of their morphemic representations in writing or in speech. In most dictionaries there would be a single entry for *controversy*, with two British English pronunciations, and a single entry for *encyclopaedia*, *encyclopedia*, here with two alphabetically adjacent spellings.

Since the macrostructure of dictionaries is based on the form of their lexically relevant units, most dictionaries would have a single entry each for *penicillin*, with one 'sense', and for the noun *crane*, with two 'senses'. About *bank*, however, dictionaries differ. Almost all would have separate entries for the **homographs** [*see* SEMANTICS] ^{1}*bank* 'shore' and ^{2}*bank* 'financial institution' because of their different origins or

Table 1 Form–content mappings

Mapping	*Form*	*Content*	*Dictionary entries*	*Senses*
One–one	*penicillin*/ˈpeniˈsilin/	‘drug x’	1	1
	encyclopaedia, *encyclopedia*	‘reference book x’	1	1
	controversy/ˈkontrəvəːsi, kənˈtrovəsi/	‘dispute’	1	1
One–many	*crane*/ˈkrein/	‘bird x’ ‘machine x’	1	2
	bank/ˈbaŋk/	‘shore’	2 or 3	3
		‘financial institution x’		
		‘deposit or keep (money) in a bank’		
Many–one	*furze*/ˈfəːz/ *gorse*/ˈgɔːs/	‘plant x’	2	1
Many–many	*toilet*/toilit/ *loo*/ˈluː/ *lavatory*/ˈlɑvatəri/	‘appliance x’ ‘site of appliance x’	3	2

etymologies: [1]*bank* having come into Middle English from Scandinavian; [2]*bank*, from French or Italian. As for the verb *bank*, some dictionaries would make it part of the entry for [2]*bank* on etymological grounds; other dictionaries would make it yet a third homograph: [3]*bank*. Such dictionaries homograph not only by etymology but also by part of speech.

Most dictionaries are willing to bring together in a single entry a set of senses that differ in meaning but have a common etymology and at least one common written morphemic representation, especially when their syntactic use, shown by their part of speech [*see* HISTORY OF GRAMMAR], is the same.

However, certain modern French dictionaries, notably the Larousse *Dictionnaire du français contemporain* (*DFC*) and *Lexis*, impose additional restrictions on their entries. Each entry must have a single set of inflections and a single set of derivatives. A dictionary that applied this principle to English would have to make two homographs of the verb *shine:* [1]*shine* (*shined*) and [2]*shine* (*shone*), and two homographs of the adjective *lame*, of which [1]*lame* ‘crippled’ would have the derivative *lameness* and [2]*lame* ‘inadequate’ would have the derivatives *lameness* and *lamely*.

The lexical units discussed so far have had the form of single words. However, dictionaries usually enter other types of lexical unit as well. These include the following:

1. Units ‘below’ the word: **bound morphemes** that help to form inflections, derivatives and compounds: *pre-*, *-ing*, *-ly*, *-ness*, *Eur-*, *-o-*.
2. Units ‘above’ the word, such as:
   a. units consisting of parts of more than one word, e.g., **blends** and **initialisms** like *smog* (***sm****oke* plus *fo****g***), *VIP*, *NATO*;
   b. units including more than one complete word, i.e. **compounds** and **idioms** like *blackbird*, *bank on*, *give up*, *night owl*, *hammer and tongs*, *at all*, *kick the bucket*. For such **multi-word combinations** to be considered true **multi-word lexical units** the convention is that their meanings should be more than the sum of the meanings of their components. Thus *night owl* is a lexical unit but *nocturnal owl* is not, and *kick the bucket* is a lexical unit when it means ‘die’ but not when it means ‘strike the pail with one’s foot’.

An important class of lexical units, some single-word, some multi-word, is the class of

proper names, whether of real entities such as *Atlanta*; *Aristotle*; *Hood*; *Thomas* or of fictional entities such as *Atlantis*; *Ajax*; *Robin Hood*. It can be argued that proper names, though they are lexical units, are lexical units of no language in particular, or of all languages. To be sure, the same argument could be advanced with respect to many technical terms like *penicillin*.

Many dictionaries, e.g. monolingual dictionaries for native speakers, strive to limit their entries to lexical units, including or excluding the proper names of real entities. Other dictionaries, e.g. monolingual learners' dictionaries and bilingual dictionaries, enter lexically relevant units that are not lexical units. Thus a dictionary might enter **routine formulas** like *Many happy returns!* or *Here goes!* because their use is pragmatically restricted. An English–French dictionary might enter *rural policeman*, which is not a lexical unit of English, because its French translation, *garde champêtre*, is a lexical unit of French. And it might enter the phrase *beat* ***a*** *drum*, which is not a lexical unit of English, in order to show that its French translation *battre* ***du*** (rather than the dubious ?**un**) *tambour*, though not itself a lexical unit of French, is nevertheless not a word-for-word equivalent of its English counterpart either – *a* in English would be *une* or *un* in French. Such units as *Many happy returns!*, *rural policeman*, and *beat a drum* are lexically relevant because their use or their translation presents a problem.

Organisation of the macrostructure

For anyone consulting or producing a dictionary, there are three questions immediately relevant to its macrostructure:

1. Is the macrostructure single or multiple?
2. Which units are main entries and which are subentries?
3. What is the ordering of graphically similar units (**homologues**) and, in particular, graphically identical units (**homographs**)?

1. A dictionary may display all its lexically relevant units in a single A–Z list; alternatively, it may relegate certain types of unit (e.g., abbreviations, 'real' proper names) to appendices.
2. Dictionaries differ greatly in their main-entry policies. But here is a list of types of lexical unit going from those most likely to be main entries to those most likely to be subentries under one of their components: single morphemes (*furze*, *pre-*); blends (*smog*) and initialisms (*VIP*, *NATO*); noun compounds **written solid**, i.e. without a space between the parts of the compound (*blackbird*); noun compounds **written open**, i.e. with a space between the parts of the compound (*night owl*, *hammer and sickle*); verb compounds (phrasal verbs like *give up*); non-verb compounds and idioms (*at all*, *hammer and tongs*, *in front of*); verb idioms (*kick the bucket*). In general, English-language dictionaries have a far higher proportion of main entries than dictionaries of many other languages.

   One important class of possible subentries is derivatives whose meaning is that of the sum of their parts, such as *lameness* from *lame* or *pre-war* from *war*. By convention, such derivatives, unlike *nocturnal owl*, are regarded as lexical units despite their **semantic transparency**; that is, despite the fact that their meaning is easily understood from the meanings of the parts of which they are composed. Large dictionaries may make them main entries; many smaller dictionaries make them subentries to save space. However, such subentries are presented without explicit explanation of their meaning. Those formed by suffixation (*lameness*) are entered under their source (*lame*) as so-called **undefined run-ons**; those formed by prefixation (*pre-war*) are in English-language dictionaries typically listed in alphabetical order under their prefix, e.g., *pre-;* but in some dictionaries of other languages, e.g., those, like the Larousse *DFC* and *Lexis*, that homograph by derivational families, they appear out of alphabetical order under their sources (so that, in English, *pre-war* would appear under its source, English *war*), with cross-references to them from their proper alphabetical position in the macrostructure.
3. Graphically identical homologues (homographs, like ^{1}*bank n*, ^{2}*bank n*, ^{3}*bank v*) may be ordered historically – older before newer; by perceived frequency – more frequent before less frequent; or even by the alphabetical

order of their part of speech – *a*djective before *n*oun before *v*erb. For graphically similar homologues, a variety of related algorithms may be used, such as lower-case before capital (*creole*, *Creole*), solid before spaced (*rundown*, *run down*), apostrophe before hyphen(s) (*o'*, *-o-*) – or any of these rules may be reversed! Thus in *Webster's Third New International Dictionary* (W3, 1966; first edition 1961) we find, in order, the main entries *run down* (phrasal verb), *rundown* (adjective), *rundown* (noun) – whereas in *Merriam-Webster's Collegiate Dictionary Eleventh Edition* (W11, 2003) we find, in order (with the dates there given), *rundown* (noun: 1908), *rundown* (adjective, circa 1821), *run down* (phrasal verb, circa 1578). The earlier dictionary (W3) orders these in effect historically; the later dictionary (W11) goes from more word-like to less word-like and more phrase-like.

Lexically relevant information

About the lexically relevant units they enter, dictionaries provide any or all of the following types of lexically relevant information:

1. Information about the **etymology**, or origin, of the unit.
2. Information about the form of the unit, including spelling(s) and pronunciation(s): English probably has more spelling variation than any other standard language. Other sorts of language-specific information may be given as well, such as the gender of nouns.
3. Syntactic categorisation and subcategorisation. In the first instance this information is given by a part-of-speech label (*noun*, *verb*, etc.), but subcategorisation can be supplied to any **delicacy** desired; that is, in finer and finer detail. Thus a lexical unit represented by the word form *tell* may be categorised as *verb*, *verb transitive* (***tell*** *the truth*), or *verb ditransitive* (***tell*** *them the truth*). Other sorts of language-specific information may be given as well, such as the cases governed by prepositions or verbs.
4. Inflections. Thus, the entry for *tell* will show that its past and past participle are *told*. Other sorts of language-specific information may be given as well, such as the perfective forms of verbs.
5. Derivatives, especially if, like *lameness*, they are of the semantically transparent type that can qualify as undefined run-ons.
6. 'Paradigmatic' information, such as **synonyms** (same meaning, such as *furze* and *gorse*), **antonyms** (opposite meaning), **superordinates** (*crippled* is superordinate to one sense of *lame;* the sense of *homologue* used in this encyclopedia article is superordinate to *homograph*), **converses** (like *buy* for *sell*), and even **paronyms** or **confusables** (like *infer* for *imply*). A special case of synonymy is presented by pairs like *launchpad/launching pad* or *music box/musical box*, which differ only by the presence or absence of an affix.
7. 'Syntagmatic' information; that is, information about the use of the item in forming sentences. Some syntagmatic information is conveyed by the syntactic categorisation mentioned above. Additional information may also be provided about **complementation** by specific structures (***tell*** *them to leave* vs. ***saw*** *them leave*), **collocation** with specific words (***fond*** *of* vs. ***fondness*** *for*), and **selectional restrictions** to specific types of words (such as that the verb ***capsize*** is associated with boats or ships, or that the verb *frighten* requires a direct object that is 'animate': ***frightened*** *the child*, but not ****frightened*** *the stone*).
8. 'Analogical' information about the **lexical field** of which a given lexical unit is a part. Subsuming and perhaps transcending paradigmatic and syntagmatic information, analogical information is given sparingly by English-language dictionaries and thesauruses, but much more extensively by French dictionaries – especially those produced by Robert. An English-language 'alphabetical and analogical' dictionary *à la* Robert might at its entry for *horse* provide cross-references to types of horse (*mare*, *pony*), its colours (*bay*, *roan*), its parts (*hock*, *pastern*), its gaits (*trot*, *canter*), and other 'horsy' words (*saddle*, *jockey*, *gymkhana*). At *horse*, *The Pocket Oxford Dictionary* (Fourth Edition, 1966; first edition 1942) offered *stallion*, *mare*, *gelding*, *foal* … *palfrey*, *yearling* … *neigh*, *snicker*, *whinny* … *gallop*, *canter*, *trot* … *kick*, *buck*, *rear* … *Dobbin*, *gee-gee*, *Rozinante*, *equine* … It is hard to carry through such a project consistently in a small

book dictionary – but easier in an online computerised one.

9. 'Diasystemic' information, indicating whether or not something belongs to the unmarked standard core of the language that can be used at all times and in all places and situations. According to Hausmann (1977: chapter 8), lexically relevant units can receive – typically by means of labels or usage notes – any or all of the following types of diasystemic marking: **diachronic** (e.g., *archaic*, *neologism*); **diatopic** (e.g., *American English* for *elevator* 'lift', *British English* for *loo* and *lift*, 'elevator'); **diaintegrative** for foreign borrowings (e.g., *German* for *Weltanschauung* or *Sprachgefühl* if entered in an English-language dictionary); **diastratic** (e.g., *informal* for *loo*, *formal* for *perambulator*); **diaconnotative** (e.g., from *Merriam-Webster's Collegiate Dictionary Eleventh Edition (W11)*, *often disparaging* for *dyke*); **diatechnical** (e.g., *law* for *tort*, *anatomy* for *clavicle*); **diafrequential** (e.g., *rare*); **dianormative** (e.g., *substandard* for *ain't*).
10. Explanation of use, meaning, and reference: see below.

The **domain** of the information provided by dictionaries may be a whole entry or part of an entry. Thus, at an entry for the noun *crane*, the domain of both its spelling and its pronunciation is both lexical units or senses it represents ('bird' and 'machine'). But at an entry for the verb *shine*, dictionaries must show that the domain of its inflection *shined* is restricted to the meaning or sense 'polish', while *shone* prevails elsewhere. And an entry for *colour/color* should show that for all the lexical units or senses it represents, the spelling *color* is American English and the spelling *colour* is British English: here the diatopic marking applies to spelling alone.

Finally, lexicographers and dictionary users alike should bear the following in mind:

1. Information may be given covertly as well as overtly. Thus the *absence* of a diasystemic label indicates that a lexical unit belongs to the common core of the language, and the *absence* of inflections in the entry for a unit may show that the unit has none, but may also imply that its inflections are regular (or can be inferred from the inflections of its components).
2. Information of the same type may be given in more than one way. Thus the transitivity of a verb may be shown by its part-of-speech label (*v.t.*), by the form of its definition, and/or by examples of its use, as well as by special codes, as in learners' dictionaries.
3. Dictionary information can help with both understanding language ('**decoding**') and producing language ('**encoding**'). Some dictionaries, e.g., learners' monolingual dictionaries and the native-language-to-foreign-language parts of bilingual dictionaries, emphasise their encoding function more than others, e.g., monolingual dictionaries for native speakers.

Dictionary explanations

Dictionaries may offer explanations of the use, meaning, and reference of the lexically relevant units they enter. **Use** has to do with the syntactic and pragmatic functions of the unit; **meaning**, with the relation of the unit to other lexically relevant units; and **reference**, with the relation of the extralinguistic item named by the unit to other extralinguistic items. Thus a dictionary entry for the noun '*taxi*' might begin with a statement of its meaning in the form of a translation (such as French 'taxi') or a definition (such as 'car for public use with driver and meter that shows the fare the driver charges the passenger'); the definition relates the unit *taxi* to such other units as *car*, *driver*, *meter*, *fare*, *passenger*. There might then follow an example such as 'She *hailed* a passing taxi by shouting "*Taxi!*"'; the example shows the use of '*taxi*' syntactically in collocation with 'hail' and pragmatically as a kind of interjection. The dictionary entry might also include a group pictorial illustration of, say, a taxi, a bus, and a tram (with cross-references to the picture at '*taxi*' from the entries for '*bus*' and '*tram*'); the illustration shows how the real-world referents of '*taxi*', '*bus*', '*tram*' differ.

Dictionaries use at least the following seven explanatory techniques, alone or in combination:

1. **Explanatory cross-reference** – as when *came* is explained as '*past of* come'.

2. **Illustration** – This includes pictures, tables, and diagrams.
3. **Exemplifıcation** – Thus for the noun *vow* the example *She **made** a vow **to** avenge her father's death* shows collocation with *make* and complementation by a *to*-infinitive, as well as reinforcing the notion that a vow is a solemn promise.
4. **Expansion** – For example, *VIP* is expanded to '*V*ery *I*mportant *P*erson', *NATO* to '*N*orth *A*tlantic *T*reaty *O*rganisation', or *smog* to '***sm**oke* plus *fo**g***'. Expansion is particularly appropriate for initialisms and blends, and functions as an etymology. When the expansion is sufficiently informative, it also functions as a definition, as in the case of *VIP* and *smog*. In the case of *NATO*, however, expansion is not sufficiently informative to tell the dictionary user anything about the membership and purpose of NATO.
5. **Discussion** – Here this is used in more or less its everyday sense to mean a discursive and at most semi-formalised technique that can present any of the types of lexically relevant information described above. A short discussion – a so-called **usage note** – can supplement or replace a label (e.g., the usage note '—often used disparagingly' for *dyke* in *Merriam Webster's Collegiate Dictionary Tenth Edition* (W10: 1993), which in W11 (2003) has become the label *often disparaging*) or a definition. For example, at [1]*here adv*, W11 explains its subentry for the routine formula *here goes* as follows: '—used interjectionally to express resolution or resignation esp. at the beginning of a difficult or unpleasant undertaking'. For lexical units serving as interjections or function words, discussion is often the explanatory technique of choice. A longer discussion in the form of a **synonym essay** or **usage essay** can present information too detailed to compress into examples and too loosely structured to be formalised as a definition.
6. **Definition** – This is a formalised paraphrase. The definition of a lexically relevant unit presupposes a delexicalisation of the unit into its components; these components are then reassembled into another lexically relevant unit that is a hierarchically ordered **lexical set** whose content characterises the meaning and reference of the **definiendum** – the item to be defined – while its form instantiates the definiendum's use. For example, a lexical unit represented by *bachelor* might be delexicalised into the components 'male', 'adult', 'never been married', which are then reassembled into the lexically relevant noun phrase 'man who has never been married'. The content of this definition characterises the meaning and reference of the word *bachelor*, while the form of the definition – a countable noun phrase – instantiates the grammatical use of the word *bachelor* – a countable noun. Thus nouns are defined by noun phrases; verbs by verb phrases (which for transitive verbs may contain a slot for the direct object); adverbs, prepositions, adjectives – and even some bound morphemes [*see* MORPHOLOGY] – by phrases or clauses that can function in the same way as the definiendum.

Such standard dictionary definitions may be classified into:

a. **definitions by synonym**, in which all the information is compressed into a single lexical unit (e.g., *gorgeous*: 'striking');
b. **analytical definitions**, in which primary syntactic, semantic, and referential information is provided by one part of the definition, the **genus**, and secondary information by the rest, the **differentiae** (e.g., *bachelor*: 'man who has never been married', where *man* is the genus and *who has never been married* is the differentia; or *gorgeous*: 'strikingly beautiful', where *beautiful* is the genus and *strikingly* is the differentia);
c. **formulaic definitions**, in which primary semantic and referential information is provided by one part of the definition, while the rest provides primary syntactic information together with secondary semantic and referential information (e.g., *gorgeous*: '*of/having/ that has* striking beauty').

A single lexical unit or sense may have more than one definition: these definitions may be linked by **parataxis** (apposition or asyndetic co-ordination, as in *gorgeous*: 'of striking beauty, stunning') or **hypotaxis** (subordination, as in *gorgeous*: 'of striking beauty; *specifically*, stunning').

Besides standard dictionary definitions, ordinary people, including lexicographers off duty, use definitions of other types, such as *'tired* is when you want to lie down'. Such **folk definitions** are used in some dictionaries for young children. For example, the American *Charlie Brown Dictionary* has *hog*: 'When a male pig grows, he becomes a *hog*'. Non-standard definitions are also used in the British learners' monolingual *Collins COBUILD English Language Dictionary* (COBUILD 2001), which has *hog*: 'A **hog** is a pig. In British English, **hog** usually refers to a large male pig that has been castrated, but in American English it can refer to any kind of pig'. Here we have something analysable either as one long non-standard definition or as one short one followed by a discussion. Note that the non-standard explanations of *hog* in these two dictionaries are not altogether in accord. Among the several possible ways of formulating their standard counterparts might be the following dictionary entry, which identifies three senses:

'**hog n 1** *chiefly American English:* pig [definition by synonym] **2** *chiefly American English:* adult male pig, adult boar [two analytical definitions linked by parataxis] **3** *chiefly British English:* castrated adult boar [analytical definition]'.

7. **Translation** – The process of definition yields a definition as its product. At the level of a whole text, the process of translation likewise yields as its product a translation. But the translation of a lexically relevant unit need not yield a relexicalised translation (a so-called 'translation equivalent') of that unit. Sometimes, instead, it yields a foreign-language definition, especially in the case of culture-specific items like *Scotch egg*, which Collins-Robert explains as *œuf dur enrobé de chair à saucisse et pané*; sometimes a foreign-language discussion, as for pragmatically restricted routine formulas from a very different culture; and sometimes nothing at all, as when one language uses, for instance, a preposition (Spanish: *María vio* ***a*** *Clara*) in constructions in which another language uses none (English: *Maria saw Clara*). Furthermore, the process of context-free lexical translation can produce translation equivalents either at the level of lexical units, or at the level of their morphemic representation. Thus there is a difference between the superficially similar English–French equations *penicillin*: 'pénicilline', where one English lexical unit or sense ('medicine') has been translated into one French lexical unit or sense, and *crane noun*: 'grue', where an English representation of two lexical units or senses ('bird'; 'machine') has been translated into a French representation of two analogous lexical units or senses. The first case is a translation of an English one–one lexical mapping into a French one–one lexical mapping; the second, a translation of an English one–many lexical mapping into a French one–many lexical mapping. However, both equations can be regarded as one–one mappings of a single 'translation unit' of English onto a single French translation equivalent.

Other possible mappings of source-language translation units onto target-language translation equivalents are:

Mapping	*English translation unit(s)*	*French translation equivalent(s)*
one–many	*jacket* (garment)	(of woman's suit) *jaquette*; (of man's suit) *veston*
many–one	*bucket; pail*	*seau*
many–many	*furze; gorse*	*gênet(s) épineux; ajonc(s)*

In these last three cases, the translation units have been lexical units (of English), and their translated explanations have been translation equivalents (of French) – that is, lexical units, too. But, as we have seen, neither translation units nor their translated explanations need be lexical units. All permutations and combinations occur in bilingual dictionaries: lexical unit–lexical unit (*penicillin:* 'pénicilline'); lexical unit–non-lexical unit (*Scotch egg*: 'œuf dur enrobé de chair à saucisse et pané'); non-lexical unit–lexical unit (*rural policeman*: 'garde champêtre'); non-lexical unit–non-lexical unit (*beat a drum*: 'battre du tambour'). Unfortunately, most bilingual dictionaries do not distinguish consistently between those

translation units and translated explanations that are lexical units and those that are not.

The example '*jacket* (garment)' above shows that when bilingual dictionaries deal with a single morphemic representation of more than one lexical unit (e.g., *jacket noun 1*: 'garment x' *2*: 'skin of baked potato' …), they increasingly use various devices as **sense discriminators** to show which lexical unit they are translating, and the example '(of woman's suit) *jaquette*' shows that they use similar devices to distinguish the domains of their translations. Such orientating devices can utilise any of the types of lexically relevant information listed above. They may also be employed even in monolingual dictionaries as sense discriminators before the definitions, as when the *Encarta World English Dictionary* (1999) offers: '**crane** … **n.1. LIFTING MACHINE** a large machine used … **4.** BIRDS **LONG-LEGGED BIRD** a large … bird that … '

Whatever explanatory technique or techniques they use, dictionaries must order their explanations when a single article deals with more than one lexical unit and therefore requires more than one explanation. Such lexical units, or 'senses', may be ordered historically, by perceived frequency, by markedness (unmarked before diasystemically marked) or semantically ('basic' before 'derived', 'literal' before 'figurative'). However, semantic ordering may coexist with any of the other ordering principles, in which case semantically related senses are grouped together, and each such 'sense group' is ordered according to its age, its frequency, or its markedness. The ordering of senses may or may not follow the same principles as the ordering of homologues in the macrostructure. Thus some dictionaries that order senses by frequency nevertheless order homographs historically. The following hypothetical dictionary entry shows the use of two sense groups **(1**, **2)** to cover four senses and go from literal to figurative:

'**hog … n … 1 a** *chiefly American English:* pig **b** *chiefly American English:* adult male pig, adult boar **c** *chiefly British English:* castrated adult boar **2** *informal:* greedy person'.

As for subentries such as run-ons and idioms, they are either collected at one place in the article – typically near the end – or scattered throughout it, each subentry going near the lexical unit or sense to which it is felt to be most closely related.

Lexicographic evidence

Lexicographers need to decide which lexically relevant units should be entered in a dictionary and what information should be given about them, and like investigators in other fields they use evidence gained from three overlapping processes of investigation; namely, **introspection**, **experiment**, and **observation**. Lexicographic observation may be of **primary sources**, e.g., authentic language in use (formerly written language only, but now sometimes recordings of spoken language also), or of **secondary sources**, e.g., existing dictionaries and grammars.

Moreover, introspection, observation, and experiment have come to be used not only to investigate language for lexicographic purposes, but also to investigate the use of dictionaries and, in the form of market research, the needs and wishes of dictionary users. Such investigations are undertaken not only to improve the form and content of dictionaries, but also for the commercial purpose of increasing their distribution.

Other developments

One such is the existence of specialised dictionaries (e.g., of synonyms, of neologisms, of euphemisms, of rhymes, of collocations, of idioms, of phrasal verbs, of the words used by Shakespeare or in the Bible).

Another is the availability of lexical resources that purport to mimic the lexical knowledge of the native speaker. One such lexical resource is the Explanatory and Combinatory Dictionary of Igor Mel'čuk et al. (now principally under the auspices of the Université de Montréal). That is a format in which both the meaning and the use of lexical items are covered thoroughly. Another such lexical resource is the WordNet project of George Miller et al. at Princeton University.

Yet another development is the rise of mechanical concordancing systems. These allow

lexicographers the **observation** of **primary sources** of hitherto undreamt-of size: hundreds of millions of words can now be observed in context whereas at most tens of millions of words could be observed heretofore. I speak here not only of the Mega-Corpuses that have been constructed computationally but also of the information available to anyone who surfs the Net in search of e.g. *bling* or *hoodie*. Does such increase in the quantity of information betoken an increase in its quality? Perhaps. We can now deal more confidently with neologisms than heretofore. We can now tell with some assurance which senses are more, which less, frequent: that *cherry* 'fruit' may well be more common than *cherry* 'cherry tree'. (But did our linguistic intuition (***Sprachgefühl***) not tell us that already?) We can say with confidence whether *Argentine* is more frequent than *Argentinian*. We can tell also whether in British English the collocation *bored of* is more common than its World-English counterpart *bored with*; and which senses of *hog* (if any) are more American than British. And so forth.

A very important function of computation is to make easier the generalisation in dictionaries of what is sometimes called best practice. That requires the provision of dictionary text either as diskettes or as e-mail attachments. It enables lexicographers who find at *February* the construction *in mid-February* to make sure to include at *November* the construction *in mid-November;* and – which has traditionally been much harder because of the difficulty of working backwards in alphabetical order – it enables lexicographers who have at *November* finally realised the worth of the construction *in mid-November* to go back and before publication add at *February* the construction *in mid-February*. It also enables lexicographers to do what they appear to have done never or rarely; e.g., to establish that such items as *clink*, *clank*, and *clunk* constitute a lexical set that deserves to be both related and distinguished (as by their definitions and examples).

Another and perhaps more obvious function of computation is the creation of on-line dictionaries, of which perhaps the most ambitious is the multi-lingual Wiktionary. Such works can make room for all sorts of information (including in principle, at *horse*, horse colours such as *bay* and *roan*). My delight at their creation is tempered by my belief that their content is only as good as what is provided for them by human lexicographers. In the end, the amazing potential of hardware and software remains a function of the contribution to them of fleshware: the human mind of the human lexicographer.

The significance of dictionaries

Dictionaries are important as repositories of information about language and about social attitudes (for instance, ethnic slurs were marked diaconnotatively considerably before sexual slurs); as texts with relatively explicit and formalised conventions; and as the oldest and most widespread self-instructional learning aid. They have long enjoyed the favour of the general public, and commend themselves to the attention of anyone interested in language – both for what they *say*, and for what they *are*.

R. F. I.

Suggestions for further reading

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Lexis and lexicology

Introduction

The study of lexis is the study of the vocabulary of languages in all its aspects: words and their meanings, how words relate to one another, how they may combine with one another, and the

relationships between vocabulary and other areas of the description of languages (the phonology, morphology and syntax).

Lexical semantics

Central to the study of lexis is the question of word meaning. If the word is an identifiable unit of a language then it must be possible to isolate a core, stable meaning that enables its consistent use by a vast number of users in many contexts over long periods of time. Linguists have attempted to see the meaning of a word in terms of the features that compose it – its **componential features** – and the process of analysis of those features as **lexical composition**. Most important in this respect is the work of Katz and Fodor (1963). According to them, words are decomposable into primitive meanings and these **primitives** can be represented by **markers**. In addition, **distinguishers**, specific characteristics of the referents of words, serve to differentiate between different word senses. The description of a word in a dictionary must cover the wide range of senses that words can have: the dictionary entry is a 'characterisation of *every* sense that a lexical item can bear in *any* sentence' (Katz and Fodor 1963: 184).

Another way of looking at the features of a word's meaning is **componential analysis** (**CA**). CA breaks the word down into a list of the components present in its meaning; thus *man* can be ascribed the features +HUMAN +ADULT +MALE (Leech 1981: 90). Once again, the purpose of CA is to distinguish the meaning of a given word from that of any other word, but the features attached to a word will also identify it as belonging to a **field** or **domain** (Nida 1975: 339), which it shares with other words having common components. *Father*, *mother*, *son*, *sister*, *aunt*, etc. are united in having the components of HUMAN and KINSHIP in common (Nida 1975: 339). CA enables us to identify **synonyms**, i.e. words that have identical componential features, regardless of differences of register, and to identify anomalous combinations such as 'male woman' (Leech 1967: 21).

But CA and the kind of labelling proposed by Katz and Fodor are open to criticism. Most powerful among early criticisms to appear was that of Bolinger, who showed that the two categories of marker and distinguisher could easily be collapsed, rendering the distinction questionable: the distinction anyway did not correspond to any clear division in natural language (Bolinger 1965b). Nor could such a theory easily cope with metaphor, or with the fact that much of natural-language meaning resides not only in words but in longer stretches of morphemes, or **frozen forms** (Bolinger 1965b).

Also important in the study of lexis is **semantic field theory**. Field theory holds that the meanings represented in the lexicon are interrelated, that they cluster together to form 'fields' of meaning, which in turn cluster into even larger fields until the entire language is encompassed. Thus *sprinting*, *trotting* and *jogging* cluster into a field of running, which in turn clusters with many other verbs into a larger field of human motion, and so on to a field of motion in general. Lehrer (1969) sums up the central feature of field theory: 'that vocabulary is organised into lexical or conceptual fields, and the items within each field are tightly structured with respect to each other'. This view goes back to Trier in the 1930s (see Lehrer 1974: 17; Lyons 1977b: 253), and the notion that the entire vocabulary can be divided and subdivided into interlinked fields underpins such works as *Roget's Thesaurus*.

Field theory can be used to illustrate language change: the way semantic space is carved up and realised in lexical items changes constantly; it can also be used in contrastive analysis of different languages (see Lehrer 1974) to illustrate how a given semantic area is subdivided similarly or differently in different languages. Languages often differ even in apparently quite basic lexical divisions, and fields such as temperature terms, kinship terms, colour terms, parts of the body and divisions of the animal and vegetable worlds will divide the semantic space differently and reflect this in the vocabulary items covering those fields. Lehrer (1969 and 1978) offers seminal applications of field theory to cooking terms and makes interesting generalisations concerning the formal properties of words that share common fields.

But Lehrer (1974) and Lyons (1977b) both see shortcomings in field theory. For one thing, words are not always sharply separated from one another in fields, and Lehrer suggests that Berlin

and Kay's (1969) view, that there are **focal points**, or **prototypes** (Rosch 1973, 1977a; Rosch et al. 1976), within fields rather than clearly delineated boundaries between words, might capture better how lexical meaning is perceived. What is more, not all words are amenable to field analysis; even more fundamentally, perhaps, the relationship between actual words and the concepts they stand for – which can only be expressed in words – is not at all clear (Lehrer 1974: 17). Lyons' criticism overlaps with Lehrer's: both see as a weakness in field theory the fact that it fails to take into account the contribution to meaning of syntagmatic features, concentrating as it does solely on paradigmatic relations (Lehrer 1969; Lyons 1977b: 261). Thus we cannot say much about the meaning of *bark* without reference to *dog*, or the colour *auburn* without mention of its restricted collocation with *hair* rather than *bicycle* or *door*.

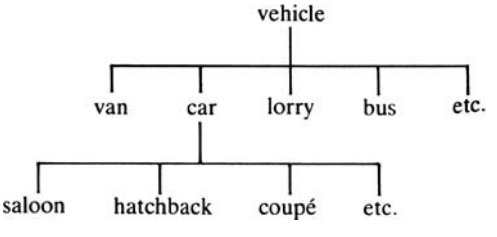
Relations between items

Field theory raises the question of how vocabulary items are related to one another in terms of meaning. Lexical semanticists have devoted much attention to formulating basic relations between words; chief among such efforts have been Ullmann (1962), Lehrer (1974), Nida (1975), Lyons (1977b), Leech (1981) and Cruse (1986). Leech and Lyons discuss basic or **primitive** semantic relations, principally **synonymy**, **antonymy** and **hyponymy**. Ullmann (1962: 141) discusses synonymy and concludes that it is very rare that words are 100 per cent interchangeable. Words may share identical componential features but may still be distinguished along a variety of dimensions of actual use. He quotes Collinson's (1939) set of nine principles whereby words may be distinguished – these include literary and non-literary usage, neutrality versus marked evaluation, formal versus colloquial usage, etc. Taking usage into account conflicts with a purely componential view, which is only concerned with a word's inherent, abstract features.

Antonymy, or oppositeness, is also not an entirely straightforward matter. Leech (1981: 92) points out that possible 'opposites' to *woman* include *girl* and *man*. It is thus more correct to label *woman* as **incompatible** with *man*, *boy* and *girl* within its field. Lyons also uses incompatibility, referring to the relationship between words in sets such as flower names or names of the days of the week (Lyons 1977b: 288). Further types of oppositeness distinguish between pairs such as *alive* and *dead* and *hot* and *cold*. The first pair are called by Lyons (1977b: 291) **ungradable**, and the latter pair by **gradable**: intermediate terms exist between *hot* and *cold;* namely, *warm*, *cool*, etc. Leech calls such gradables **polar oppositions** (Leech 1981: 100). Opposite terms such as *big* and *small* may even have other **intensified** terms at the polar extremes which represent a more complex set: *enormous* occupying a position beyond *big*, *tiny* beyond *small;* while other terms occupy the territory in between: *middle-sized*, *average*, *medium*. In such cases it seems that terms like *big* and *small* have a focal or **core** status (see Carter 1987). Gradable antonyms are relative in meaning, and their relativity is sociolinguistically determined (Lyons 1977b: 274; Leech 1981: 102).

Lyons (1977b: 274) prefers to keep the term *antonymy* for the gradable antonyms only and suggests **complementarity** as a description of the ungradables, **converseness** for the reversible relationship between terms such as *husband/wife*, *teacher/pupil*, where to say *A is B's husband* implies *B is A's wife*, and **directionality** for pairs such as *arrive/depart*, *come/go*. Directionality and converseness are given the more general heading **relative opposition** by Leech (1981: 102).

Hyponymy, the relation of inclusion, is dealt with by Lyons (1977b: 291–5) and, with new insight, by Cruse (1975, 1986). Hyponymous relations can be expressed by taxonomic tree diagrams, showing levels of generality and specificity and which words include which in their meaning. Thus a simple tree diagram for *car* showing its relations with its near neighbours might be:



Vehicle is the **superordinate** term and *car* is a hyponym of it. *Van*, *car*, *lorry*, etc., are **cohyponyms**. *Car* is then, in its turn, superordinate to *saloon*, *hatchback*, *coupé*, etc. Hyponymy, as is evident, is one of the major organising principles of thesauruses. Not all taxonomic-type relations, however, are true examples of hyponymy: part–whole relations such as *finger/hand* may be termed **meronymy** and Lyons (1977b: 293–301) points to a variety of types of **quasihyponymy**, which include sets such as *stroll/amble/plod*, etc., under the superordinate *walk*, and *round/square/oblong* under *shape* (where *shape* is not of the same grammatical class as the quasi-hyponyms). Cruse (1975) argues that many quasi-hyponymic relations in natural language cannot be explained at all in terms of entailment and should be seen as purely conventional arrangements of phenomena in the world. Thus *watches*, *ties*, *cameras and other presents* has no permanent implication that *If it is a tie, it is therefore a present* (cf. *If it is a rose, it is therefore a flower*).

The discussion of relations between the items in sets that realise semantic fields does not necessarily imply that all items behave in the same way. If we consider the gradable antonyms it is clear that one term of the pair usually operates as the **unmarked** term, i.e. the question *How long will the meeting be?* is heard as a neutral question concerning duration: *How short will the meeting be?* will be heard as **marked**, or else can only function where 'brevity' is already given in the context. Likewise, *How big is your house?* and *How wide is the room?* testify to the unmarked nature of *big* and *wide*. Among other incompatibles, one term can often double up as gender-marked – often, but not exclusively, male – and as gender-neutral. Lyons (1977b: 308) gives *dog* as an example, which can be used to refer to any dog, bitch or puppy, but which can also be used to differentiate gender, as in the question *Is it a dog or a bitch?* *Tiger*, *fox* and *pig* are other examples. *Dog* can thus be said to be simultaneously superordinate to *bitch* and its co-hyponym.

Syntagmatic features

So far, the discussion of lexical relations has proceeded firmly within the domain of semantics and the types of meanings carried by paradigmatic relations. But a parallel, vigorous line of study, dominated by British linguists, concentrated its efforts during the mid-to late twentieth century on syntagmatic aspects of lexis. The seeds of this variety of lexical studies are found in the work of J.R. Firth, and it is the notion of **collocation** that is Firth's principal contribution to the field.

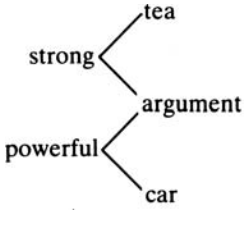
In contrast with the decontextualised, **theoretical dictionary** (Leech 1981: 207), which is the construct of decomposition, componential analysis and semantic relations, Firth is concerned with an 'abstraction at the syntagmatic level … not directly concerned with the conceptual or idea approach to the meaning of words' (1950/1957c: 196). He is concerned with the distribution of words in text, and how some occur predictably together more than others. One of the meanings of *night* is its collocation with *dark*, and vice versa: likewise, we can predict the restricted range of adjectives that commonly occur with *ass: silly*, *obstinate*, *stupid*, etc. (1950/1957b: 196).

Much of the impetus to Firth's work on collocation is provided by his concern with literary stylistics, where it is frequently necessary to recognise certain collocations as **a-normal** (1950/1957c: 196) in order to explain literary effect. Firth also gives a systematic classification of the collocational types with the verb *get* (1968: 20–3) and sees these as 'a basis for the highly complex statement necessary to define the forms of *get* in a dictionary' (1968: 20–3): this makes an interesting comparison with Katz and Fodor (1963), who were also preoccupied with the form an entry for a word in a dictionary might take (see above).

McIntosh (1961/1966) continued Firth's work on collocation and used the term **range** to describe the **tolerance of compatibility** between words. The range of an item is the list of its potential collocates: thus *molten* has a range that includes *metal/lava/lead*, etc., but not *postage*. The sentence *The molten postage feather scores a weather* violates the tolerance of compatibility of the words within it: despite our willingness to accommodate new and unusual collocations (e.g., in literary works), we cannot contextualise such an odd sentence. Yet range is not fossilised, and part of the creative process of language change is **range extension**, whereby a previously limited range is broadened to accommodate new concepts,

thus *ware* (whose range included *hard*, *table* and *house*) now includes in modern English *soft* and *firm*, in computer jargon.

Firth's seminal ideas on collocation (1957b; see also 1957d: 11–13, 267) have since been developed by, among others, Mitchell (1958, 1971, 1975), Halliday (1966a), McIntosh (1961/1966), Sinclair (1966, 1987a) and Greenbaum (1970). Central among these studies are Halliday's and Sinclair's. Halliday (1966a) is concerned with two concepts: collocation and how this, in turn, defines membership of **lexical sets**. Halliday's paper is entitled 'Lexis as a Linguistic Level', and his purpose is to sketch out 'a lexical theory complementary to, but not part of, grammatical theory' (1966a: 148). Firth had already, to a certain extent, separated lexical matters from semantics and grammar (1957b: 7–33); Halliday was now concerned to make that separation more complete. The many unresolved issues of language patterning left over when grammatical analysis, however thorough, was complete, could either be relegated to semantics or tackled at a **lexical level** of analysis, with the aim of making lexical statements at a greater level of generality than dictionaries do. As an example of the **lexicality** of collocation, Halliday compares the different collocability of *strong* and *powerful*. The figure below shows the acceptability of *strong tea* but not of *strong car*, while *argument* collocates with both. Moreover, the relation is constant over a variety of grammatical configurations: *He argued strongly against …* ; *the strength of his argument; This car has more power*, etc. So the lexical statement can operate independently of grammatical restrictions. *Strong*, *strength*, *strongly*, *strengthen* represent the 'scatter' of the same **lexical item**.



The lexical statement will not, however, remain independent but will ultimately be integrated with grammatical and other statements, a truly Firthian position. That *strong* and *powerful*, *qua* items, collocate with *argument* entitles them to enter into the same set. Each will also enter into different sets by virtue of their non-overlapping collocations with *tea* and *car*, respectively: item, set and collocation are **mutually defining** (Firth 1957b: 7–33).

Collocation and **set**, as terms in a lexical description, are analogous to structure and system in a grammatical theory: the difference is that collocation is a relation of *probable* co-occurrence of items, and sets are **open-ended** (cf. the **closed** systems of grammar). The set is a 'grouping of items with like privilege of occurrence in collocation' (Firth 1957b: 7–33). Some items in the language will not be amenable to lexical statements of any real power or significance: *the*, for example, is a **weak collocator**, combining, potentially, with almost any common noun: *blond* is a **strong collocator**, restricted to *hair* and a few related words (*tresses*, *wig*, etc.). *The* is best left to the grammarian to describe: it occupies one end of the continuum running from grammatical to most lexical, while *blond* dwells at the other end.

Words can thus predict their own environment to a greater or lesser extent. Some items predict the certain occurrence of others: when such predictability is 100 per cent (e.g., *fro* always predicts *to and*, and *kith* always predicts *and kin*) we are justified in declaring the whole of the fixed occurrence to be a single lexical item.

The notion of collocation and lexical set can also have a bearing on decisions concerning polysemy and homonymy. The occurrence of the word form *bank* in two different collocational environments (*river*, *trees*, *steep*, cf. *money*, *deposit*, *cheque*) suggests that *bank* is best described as a homonym. Likewise, non-cognate word forms (e.g., *city* and *urban*) can be shown to have the same collocates, and therefore to belong to the same set.

The set can be demonstrated as a statistical reality. Two thousand occurrences of the word *sun* might be examined in terms of what occurs three words either side of it. These 12,000 collocates might show a significant frequency of *bright/hot/shine/light*, etc. A similar operation on 2,000 occurrences of *moon* might show *bright*, *shine* and *light* to be statistically significant. These match with the collocates of *sun* and thus delineate *bright*, *shine* and *light* as candidates for members of a set in which *moon* and *sun* occur.

And so the process could repeat itself on masses of data, preferably some 20 million words of text, according to Halliday's reckoning.

Halliday's (1966a) work leans clearly towards data-based observations of lexical patterning, a field which Sinclair developed significantly in the COBUILD project at the University of Birmingham where, under his direction, a corpus of 20 million words of text was stored on computer and analysed in depth. The most notable products of this research were the COBUILD (1987) dictionary, and a clear realisation of the delicate relationship between sense and structure: the different senses of an item are often paralleled by preferred structural configurations (see Sinclair 1987b). It is also clear that the facts of lexical combinability often defy even native-speaker introspection and, equally far-reaching, that much of natural language occurs in 'semi-preconstructed phrases that constitute single choices, even though they might appear to be analysable into segments' (Sinclair 1987a). This last remark expands the concept of the lexicon from being a collection of words into a huge repository of meaning, many of whose items span several words or whole phrases and clauses; such findings confirm Bolinger's views on the nature of the lexicon (1965b, 1976).

Two other names central to the British approach to lexis are Mitchell (1958, 1966, 1971, 1975) and Greenbaum (1970). Mitchell was essentially concerned with all kinds of syntagmatic delimitation (see Cruse 1986: chapter 2) and his work represents a unique blend of levels of analysis, a syntactico-lexical approach similar to that of Sinclair in the COBUILD project. Mitchell (1971) is of prime importance. He examines the delicate interrelation of syntax and lexis – configurations containing the same lexical morphemes do not necessarily mean the same when rearranged or inflected. For instance, the *hard* in *hard work* means something different from *hard* in *hard-working*. Equally, *goings-on* means something different from that which is *ongoing*. Syntagmatic bonds between lexical items are also responsible for the unproductive characteristics of fixed collocations, or **bound collocations** as Cruse (1986: 41) calls them, and the lack of productivity of idioms. Mitchell (1971) notes as a characteristic of idioms the frequent grammatical generalisability of their structure (e.g., tournures such as *kick the bucket*, *see the light*, *hit the sack*, *bite the bullet*); Greenbaum (1970) also focuses on collocation 'in certain syntactic relationships' and concludes that limited, homogeneous grammatical classes – in his case, verb intensifiers – yield the most useful analytic results. The approach that treats collocation as a purely independent level Greenbaum calls **item-orientated**; an approach taking syntax and semantics into account is **integrated** (1970).

Multi-word lexical items

The neo-Firthian tradition, with its emphasis on syntagmatic aspects of lexis, has run parallel to, and cross-fertilised, traditional studies of idioms and other fixed stretches of language that constitute single, indivisible meanings and which display degrees of semantic transparency or opacity and degrees of syntactic productivity. **Idioms**, in the sense of fixed strings whose meanings are not retrievable from their parts have been described by Weinreich (1969), Makkai (1972, 1978) and Strässler (1982), who gives good coverage of little-known Soviet work. Additionally, a wide variety of other types of multi-word lexical units (Zgusta 1967) have come under scrutiny, such as **binominals** (Malkiel 1959), **conversational formulae** (Coulmas 1981) and **restricted collocations** (Cowie 1981). Bolinger (1976) and Sinclair (1987a) are also central to any study of multi-word units, both of them arguing for the need to see idiomaticity and **analyticity** – the amenability of linguistic phenomena to be broken down into ever smaller analytic units – as equally important to language study. This idiomatic view of the lexicon shifts the emphasis irrevocably from seeing the word as the unit of the lexicon to the adoption of more eclectic units.

The field of **corpus linguistics** has developed very rapidly since this early work and is discussed in the eponymous article in this volume.

Lexis and discourse analysis

A growing area of interest has been the relationship between lexical choice and the organisation of discourse. Halliday and Hasan's (1976/1989) description of cohesion in English includes a chapter on the lexical cohesion observable in

texts over clause and sentence boundaries. Textual content may be repeated in identical lexical form or may be reiterated by use of synonymy, hyponymy or selections from the class of general nouns. Additionally, collocation occurs over sentence boundaries and creates chains of mutually collocating words in texts. Hasan (1984) revised the 1976 model, rejecting collocation as non-structural and adding antonymy and meronymy to the structural devices for reiteration. She also examined devices for creating localised or **instantial** lexical relations realised in individual texts.

Work has also concentrated on the role of a large number of text-organising words which duplicate the work of conjunctions and sentence connectors in the signalling of textual relations between clauses and sentences and in the creation of larger patterns of discourse. Words such as *reason*, *means*, *result* and *effect* overtly indicate logical relations between clauses, such as temporality, causality, etc. Of importance here is work by Winter (1977) [*see* TEXT LINGUISTICS].

In the study of spoken discourse, much interesting research has focused on marker words, which occur widely in large spoken corpora (e.g., Tottie and Bäcklund 1986) and on the fixed formulae found in conversation (Coulmas 1979). McCarthy (1987, 1988) has reported on types of lexical cohesion, or **relexicalisation**, in conversation, and has argued for its intimate relationships with phonological features. His work owes much to Brazil (1985), who redefines the concept of paradigmatic lexical choice within the real-time constraints of discourse production.

M. J. M.

Suggestions for further reading

Bazell, C.E., Catford, J.C., Halliday, M.A.K. and Robins, R.H. (eds) (1966) *In Memory of J.R. Firth*, London: Longman.

Cruse, D.A. (1986) *Lexical Semantics*, Cambridge: Cambridge University Press.

Lehrer, A. (1974) *Semantic Fields and Lexical Structure*, Amsterdam: North Holland.

Linguistic relativity

Linguistic relativity is the thesis (Gumperz and Levinson 1996: 1) 'that culture, *through* language, affects the way we think, especially perhaps our classification of the experienced world'. Versions of it have been ascribed to various scholars of earlier times (e.g., Roger Bacon 1220–92, Wilhelm von Humboldt 1767–1835), and one version is also implicit in Saussurean structuralism (1916): for if the value of an individual sign derives from its relationship to other signs in the system, and if all systems (languages) do not divide up their 'value space' identically between identical numbers of signs (and they do not), then there is certainly some arbitrariness involved in the linguistic grid overlaid on experience by any language. However, the most famous variant is without a doubt the **Sapir–Whorf hypothesis**, so called after the American linguists Edward Sapir (1884–1939) and Benjamin Lee Whorf (1897–1941), both of whom were strongly influenced by Franz Boas (1858–1942).

At the turn of the twentieth century, many linguists in the USA were concerned to construct records of the American Indian languages before they disappeared as the Indians became more and more strongly influenced by white American society. Earlier, these languages had been investigated by linguists from Europe who had tended to impose on them grammatical descriptions based on the categories appropriate to their own Indo-European language. Boas (1911) criticises this practice, insisting that it is the task of the linguist to discover, for each language under study, its own particular grammatical structure, and to develop descriptive categories appropriate to it.

Many languages do not display the kinds of distinction which European linguists might tend to take for granted, such as the singular/plural and past/present distinctions but may instead display distinctions between categories quite new to European linguists. For example, Hockett (1958) describes the tense system of Hopi as divided into three:

- Timeless truths: *Mountains are high.*
- Known or presumed known happenings: *I saw him yesterday.*
- Events still in the realm of uncertainty: *He is coming tomorrow.*

So, whereas in English the speaker's attitude in terms of certainty or uncertainty about the propositional content of utterances is indicated

in the modal system by means of the modal auxiliaries (*can*, *may*, *will*, *shall*, *should*, *ought*, *need*, etc.), in Hopi, the tense of the verb itself carries this information.

In the same vein, Hockett says of Menomini that it has a five-way modality contrast:

1. Certainty
   /pɪʔw/: *he comes*
   he is coming
   he came
2. Rumour
   /pɪʔwen/: *he is said to be coming*
   it is said that he came
3. Interrogative
   /pɪʔ/: *is he coming?*
   did he come?
4. Positive, contrary to expectations
   /pɪasah/: *so he is coming after all*
5. Negative, contrary to expectations:
   /pɪapah/: *but he was going to come!*

Hopi also has three words which function where English only has one binder, *that*. Consider:

1. I see that it is new.
2. I see that it is red.
3. I hear that it is new.
4. I hear that it is red.

In Hopi, (1) has one word for *that*, (2) another, and (3) and (4) yet another; this is because three different types of 'representation to consciousness' are involved. In (1), the newness of the object is inferred by the speaker from a number of visual clues and from the speaker's past experience; in (2), the redness of the object is directly received in consciousness through the speaker's vision; in (3) and (4), the redness and newness are both perceived directly via the speaker's faculty of hearing (Trudgill 1974b: 25–6).

It seems clear, then, that languages, through their grammatical structure and their lexis, do not all 'interpret' the world and experience in the same way. The question is whether and to what degree this linguistic difference effects differences in possibilities of conceptualisation between cultures.

Sapir, who was taught by Boas at Columbia University from 1900, began his study of Amerindian languages with a field trip to the Wishram Indians in 1905. His experience of the Amerindian languages and culture convinced him that the connection between language and thought is direct and the influence of language on thought decisive in determining ontology (the theory of reality) (Sapir 1929, in Mandelbaum 1949: 69):

> Human beings do not live in the objective world alone, nor alone in the world of social activity as ordinarily understood, but are very much at the mercy of the particular language which has become the medium of expression for their society. It is quite an illusion to imagine that one adjusts to reality essentially without the use of language and that language is merely an incidental means of solving specific problems of communication or reflection. The fact of the matter is that the 'real world' is to a large extent built up on the language habits of the group. No two languages are ever sufficiently similar to be considered as representing the same social reality. The worlds in which different societies live are distinct worlds, not merely the same world with different labels attached.

Whorf was initially trained as a chemical engineer and worked as a fire prevention officer, and it was during his work in that capacity that he became interested in the effect of the linguistic description of an event on the way in which people perceive the event (1939/1941/1956/1997):

> Thus around a storage of what are called 'gasoline drums' … great care will be exercised; while around a storage of what are called 'empty gasoline drums', [behaviour] will tend to be different – careless, with little repression of smoking or of tossing cigarette stubs about. Yet the 'empty' drums are perhaps more dangerous, since they contain explosive vapor.

Whorf enrolled on Sapir's course on Amerindian linguistics at Yale University in 1931, and in 1932 Sapir obtained a grant for Whorf to carry out fieldwork among the Hopi Indians. He observed (1936) that, whereas the metaphysics underlying Western languages 'imposes' on their

speakers the two 'cosmic forms', time – divided into past, present and future – and space – which is static, three-dimensional and infinite – Hopi leads its speakers to see the universe in terms of two different cosmic forms, the manifest (or objective) and the unmanifest (or subjective). The manifest is everything that is or has been accessible to the senses, whereas the unmanifest is everything in the future and everything that is present in the minds of people, animals, plants and things. Nevertheless, Whorf's work led him to formulate a weaker version of the thesis of linguistic relativity than that propounded by Sapir. Whorf's **principle of relativity** (1940, in Carroll 1956: 214) says merely that, 'No individual is free to describe nature with absolute impartiality, but is constrained to certain modes of interpretation. … All observers are not led by the same physical evidence to the same picture of the universe, unless their linguistic backgrounds are similar, or can in some way be calibrated.'

It is implicit in Whorf's writings that he thought that languages could, in general, in some way be 'calibrated' – he succeeds throughout in explaining in English the differences between it and the world view it embodies and other languages and the world views they embody. Obviously, exact translating between languages as different from each other as English and the American Indian languages which occupied Whorf might be very difficult, involving, more often than not, extensive paraphrasing in order to convey all the ontological particularities that Whorf and others have noticed. Nonetheless, translating, in some sense, would be possible, and this possibility has indeed often been championed by linguists with an interest in translation. For example, Roman Jakobson proposes that (1959: 431–2):

> All cognitive experience and its classification is conveyable in any existing language. Whenever there is a deficiency, terminology can be qualified and amplified by loanwords or loan translations, by neologisms or semantic shifts, and, finally, by circumlocutions. … No lack of grammatical devices in the language translated into makes impossible a literal translation of the entire conceptual information contained in the original.

In support of such **universalism**, Wierzbicka (1996) argues that there exists a set of 'semantic primitives' or 'semantic primes' (1972: 3; 1996: 9 *et passim*), by which she means a fixed set of meaning components, which cannot be broken down into smaller meaning components and which are universal in the sense that every language has a word for them. They include, among others: 'I; you; someone; something; where; when; big; small; good; bad; do; happen' (Wierzbicka 1996: 14).

A number of studies carried out in the 1980s and 1990s focus on the linguistic realisation in different languages of the apparently universal category, deixis (see Gumperz and Levinson 1996); and Bowerman (1996: 149–50) argues that 'All languages make categorical distinctions among spatial configurations for the purpose of referring to them with relatively few expressions, such as the spatial prepositions', although what counts as a particular spatial relationship varies between languages.

Undoubtedly, the question of whether the apparent universality of fairly basic, low-level phenomena such as those just mentioned is enough to guarantee the possibility of cross-cultural conceptual compatibility will continue to exercise linguistic and philosophical imaginations. Gumperz and Levinson (1996) contains a number of studies of various cognitive and linguistic phenomena in support of both sides in the relativism/universalism debate. The philosophical aspects of the thesis of linguistic relativity and its connection with the notion of **ontological relativity** are further discussed in the entry on PHILOSOPHY OF LANGUAGE.

K. M.

Suggestions for further reading

Carroll, J.B. (ed.) (1956) *Language, Thought and Reality: Selected Writings of Benjamin Lee Whorf*, Cambridge, Mass.: MIT Press.

Gumperz, J.J. and Levinson, S.C. (1996) *Rethinking Linguistic Relativity*, Cambridge: Cambridge University Press.

Mandelbaum, D.G. (ed.) (1949) *Selected Writings of Edward Sapir in Language, Culture and Personality*, Berkeley, Calif.: University of California Press and Cambridge: Cambridge University Press.

Linguistic typology

Linguistic typology is a theoretical approach to the study of human language, with sophisticated methods and an impressive body of knowledge. The primary objective of linguistic typology is to study the structural variation within human language with a view to establishing limits on this variation and seeking explanations for the limits. Thus practitioners of linguistic typology (or **linguistic typologists**) tend to work with a large number of languages in their research, typically asking 'what is possible, as opposed to impossible, in human language?' or 'what is more probable, as opposed to less probable, in human language?'

The term 'typology' (or '*Typologie*' in German), in the context of the study of human language, was coined by the German philologist and sinologist Georg von der Gabelentz (1840–93). Linguistic typology has a long tradition that dates back to the nineteenth-century European scholarly interests in genetic relationships among languages and in the evolution of human language. The linguistic typology that was adopted in that period was essentially the classical or **morphological typology**, in which three basic strategies in the encoding of relational meaning were recognised: **inflectional**, **agglutinating** and **isolating**; a fourth, incorporating, was later added to this typology. While initially embraced by scholars with enthusiasm, linguistic typology soon came to be subsumed under or overshadowed by other interests, i.e. historical linguistics in particular.

It was not until the appearance of Joseph H. Greenberg's 1963 article on **word order** that the focus of linguistic typology, in line with the contemporary development in linguistics, shifted from morphology to syntax. Greenberg's emphasis on word order did not only spearhead a move from the classical morphology-based typology to a syntax-based one (but without morphology being neglected). But, more importantly, he also 'opened up a whole field of [linguistic] research' (Hawkins 1983: 23) by revamping and revitalising linguistic typology, which had until then been largely ignored, if not forgotten, in linguistics.

Syntax in linguistic typology needs to be construed broadly enough to encompass morphological issues because, for instance, what is done by syntax in one language may be done by morphology in another language. **Syntactic typology** may thus be better termed as **morphosyntactic typology**. Morphosyntactic phenomena that have been the focus of linguistic typology include word order and word-order correlations (e.g., Hawkins 1983; Dryer 1991, 1992, 1997), word order and morpheme order (e.g., Siewierska and Bakker 1996), case alignment (and word order) (e.g., DeLancey 1981; Nichols 1986; Dixon 1994; Siewierska 1996), grammatical relations (with particular reference to relative clause formation and causativisation) (e.g., Keenan and Comrie 1977; Comrie 1975), and person-agreement patterns (e.g., Siewierska and Bakker 1996; Siewierska 2004) among others. This morphosyntactic focus is being increasingly complemented by the coverage of phonetics/phonology, semantics, and other areas of linguistics (see Song forthcoming).

Linguistic typology involves four stages of investigation: (1) identification of a phenomenon to be studied; (2) classification of the phenomenon; (3) the formulation of (a) generalisation(s) over the classification; and (4) the explanation of the generalisation(s). First, linguistic typologists must determine what to investigate. There are no restrictions on what structural properties should or should not be studied. Nor are there any restrictions on how many properties should simultaneously be dealt with. Some may choose one property of language as an object of inquiry, whereas others may at once probe into more than one. The first and second stages of typological analysis may need to be carried out concurrently. This is because one does not know in advance whether or not the chosen property is going to be a typologically significant one. Once properties have been chosen for typological analysis, structural types pertaining to those properties will be identified or defined so that the world's languages can be classified into those types. In the case of basic word order at the clausal level, for instance, six (logically possible) types – i.e. SOV, SVO, VSO, VOS, OVS and OSV – are identified, whereby languages are typologised according to the basic word-order type that they exhibit. (The basic clause consists of three expressions denoting the entity which initiates an action [i.e. S(ubject)], the entity at which that action is directed [i.e. O(bject)] and

the action itself [i.e. V(erb)].) The identification of the six basic word-order types and the classification of the world's languages into those types will then constitute the linguistic typology of basic word order. The skewed distribution of the six basic word orders emerging from this typological classification is such that there is concluded to be a distinct tendency towards SOV and SVO in the world's languages (e.g., Hawkins 1983; Tomlin 1986; Dryer 1992). This can be taken to be a significant generalisation over the data classified – representing Stage 3 above. It will also lead to the question as to why there is this strong tendency, because, if the ordering of S, O and V were random (i.e. not motivated by some other factor[s]), each of the six basic word-order types would be represented by about 16.6 per cent of the world's languages. At this stage (i.e. Stage 4 above), every attempt needs to be made to explain the tendency in question.

Typically, in linguistic typology language-external explanations or factors found outside the linguistic system, e.g., cognition, perception, processing, communication, etc., are considered or appealed to. For instance, functional factors including thematic prominence, animacy, processing efficiency, etc., have been proposed to explain the preponderance of SOV and SVO (e.g., Tomlin 1986; Hawkins 1994, 2004). This predilection for language-external explanations situates linguistic typology in the functional, as opposed to the formal or generative, research tradition in linguistics. This is not to say that language-internal explanations are eschewed in linguistic typology. Language-internal explanations can be sought if no language-external explanations are available or forthcoming. However, language-internal explanations may ultimately be replaced by language-external ones yet to be discovered.

One of the major observations that emerged from Greenberg's seminal work on word order is that two or more structural properties may correlate with one another (to a statistically significant extent). For instance, basic word order at the clausal level has been compared with the presence (or absence) of prepositions or postpositions. Verb-initial languages (or languages with the verb appearing first in the sentence, i.e. VSO and VOS) are almost always found to be equipped with prepositions, not with postpositions (also see Dryer 1992). This means that verb-initial word order almost never co-occurs with postpositions. This constitutes one important property of human language in that it represents a strong constraint on possible variation within human language. There is no reason why the two independent properties should correlate to the effect that the presence of verb-initial word order (almost always) implies that of prepositions. Logically speaking, there should also be an abundance of verb-initial languages with postpositions, which is not the case.

Cross-linguistic generalisations like the correlation between verb-initial word order and the presence of prepositions lead to implicational universals, which take the form of 'if p, then q' or $p \supset q$. (This kind of implicational statement originated from the work of the Prague School of Linguistics.) For example, the presence of verb-initial word order (p) implies that of prepositions (q). The predicting power of implicational universals is not confined solely to the properties which they make explicit reference to. Thus, given the implicational universal 'if a language is verb-initial, then it is also prepositional', there are two other situations that fall out from that universal (not to mention the [near] impossibility of verb-initial languages with postpositions). By making no claims about them, it has the advantage of 'saying' something about non-verb-initial languages either with prepositions or with postpositions, thereby recognising these combinations as possible in human language. In other words, the implicational universal in question rules out only verb-initial languages with postpositions as an (near) impossibility – that is, p &-q (read: not q), which contradicts the original statement of 'if p, then q'. **Implicational universals** are highly valued in linguistic typology.

It does not come as a surprise – in view of its emphasis on the structural variation within human language – that one of the most prominently discussed methods in linguistic typology is **language sampling**. The best way to discover the limits on the structural variation within human language is to study all languages of the world. For obvious reasons, that is out of the question. There are said to be about 7,000 languages in the world. Individual linguistic typologists (or even a team of linguistic typologists) are unable to compare such a large number of

languages or even a small fraction thereof. What makes it even more unrealistic is the fact that there are far more languages which await linguistic documentation than those which have been described. In view of these limitations, linguistic typologists choose to work with **language samples**. Bell's 1978 article was the first to raise the issue of language sampling for linguistic typology. He explained the role of **stratification in language sampling** (i.e. the process of placing languages into different strata, e.g., genetic affiliation, geographic location, etc.), and discussed genetic, areal and bibliographic biases to be avoided in language sampling. Bell's sampling approach was based on 'proportional representation'. For instance, each language family contributes to a sample in proportion to the number of genetic groups in that family. One fundamental issue to be addressed, if not resolved, with respect to **proportionally representative language samples** is the independence of cases. This relates directly to the need to ensure that languages selected for a sample be independent units of analysis, rather than instances of the same case; one does not want to sample things of the same kind to the exclusion of things of different kinds. Dryer's 1989 article developed a novel yet ingenious method in language sampling, one of his primary aims being to achieve or maximise the independence of cases at the level of large **linguistic areas**: Africa, Eurasia, Australia–New Guinea, North America and South America. (In Dryer 1992, however, South-East Asia and Oceania are removed from Eurasia and treated as a separate linguistic area.) He also invoked the concept of a **genus**. **Genera** are **genetic groups of languages**, comparable to the sub-families of Indo-European, e.g., Romance. Genera, not individual languages, are then counted for purposes of determining linguistic preferences or tendencies in each of the large linguistic areas. The independence of cases, vital for all statistical procedures, is not demanded at the level of genera but is required strictly at the level of the five (or six) large linguistic areas, which are reasonably well defined physically and which should thus be far less controversial – and less unwieldy to handle – than the divisions between over 300 genera.

Dryer's sampling method does not just represent an improvement in language sampling but also draws attention to the theoretical importance of non-linguistic – in particular geographical – factors in investigating correlations between structural properties. For instance, the correlation between OV and A(djective)N(oun) order was once thought to be a language universal. However, Dryer (1989, 1992) demonstrates by means of his sampling method that this correlation is owing largely to the dominance of that correlation in Eurasia. In all other linguistic areas, there is in fact a clear tendency towards OV and NA. This importance of geography or areality in the interpretation of typological correlations is brought to the fore in Nichols' epoch-making book (1992). Nichols' aim is to develop linguistic typology into population typology that enables one to detect genetic and/or areal connections at considerable time depths and to probe into linguistic prehistory and also possibly into human prehistory. In other words, while operating with structural properties as linguistic typology does, population typology seeks to discover 'principles governing the [geographical or areal] distribution of structural features among the world's languages' with an eye to making inferences about the spread of languages and human migration, and thus to contributing to our understanding of linguistic prehistory (Nichols 1992: 2). In particular, Nichols' research reveals that certain structural features are distributed geographically in such a way that they must be characterised as 'global' – for example, the distribution of the inclusive/exclusive oppositions in first-person pronouns increasing from area to area on a cline going from west to east, with a clear demarcation between Old World and colonised areas, thereby mirroring the directionality of the human expansion (Nichols 1992: 185, 196–8, 275, 278). If linguistic preferences or tendencies were motivated by universal factors in human cognition or communication alone, they would be expected to distribute themselves evenly throughout the world. What Nichols' (and Dryer's) research has demonstrated is that typological properties are not evenly distributed in the world. Indeed many distributions are susceptible to geographical or areal skewings (cf. Campbell 1997b). This has led to the realisation among linguistic typologists that historical, geographical, cultural, social or other local variables

can interact with what may be intrinsic to human cognition or communication. This in turn explains why there are hardly any absolute language universals (i.e. with no exceptions) while there are many strong tendencies (i.e. with a small number of exceptions). One such variable that has been intensely investigated is, as has already been alluded to, geography or areality. Exceptions may have been brought about by contact between languages. For instance, the dominance of the correlation between OV and AN is an areal feature of Eurasia; languages in this large part of the world may have come to share this correlation because of prolonged contact – direct or indirect – between them.

The conceptual shift from 'what is possible (or more probable), as opposed to impossible (or less probable) in human language?' (e.g., 'if a language is verb-initial, then it is also prepositional') to, as Bickel (2007: 239) has it, 'what's where why?' (e.g., OV&AN in Eurasia – as opposed to the rest of the world – as a consequence of contact) is one of the most significant developments that have taken place since Greenberg's rejuvenation in the 1960s of linguistic typology. The most substantial and tangible outcome of this shift is ***The World Atlas of Language Structures*** (Haspelmath et al. 2005). In this landmark volume, over 140 typological or structural properties are investigated by a group of fifty-five linguists in terms of areal or global distribution. For instance, Dryer (2005) demonstrates that the co-occurrence of OV and Rel(ative Clause)-N(oun) order is generally found in Asia, while in the rest of the world OV languages have NRel order much more commonly; OV&RelN seems to be a distinct areal feature of Asia.

Linguistic typology, to borrow the words of Nichols (2007: 236), 'is on the roll at the moment and likely to continue' to contribute to the investigation into the nature of human language, on both empirical and theoretical levels, as it has done so for more than two centuries. Linguistic typology, at least in the first two decades of the twenty-first century, is likely to concentrate on developing or refining its research methods – not least because such a methodological exercise, more frequently than not, leads to the discovery of problems or issues of theoretical import (e.g., Dryer 1989, 1992) – and also on generating 'theories that explain why linguistic diversity is the way it is [i.e. what's where why?]' (Bickel 2007: 239). In particular, the kind of research that is willing to cross its boundaries into other disciplines (e.g., cognitive science, genetic science, human prehistory, human geography, etc.) – as foreshadowed by Nichols (1992) and Hawkins (1994, 2004) – is likely to occupy the centre-stage, while the study of the nature of human language will continue to be the primary objective of linguistic typology.

J. J. S.

Suggestions for further reading

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Linguistics in schools

There are two main ways in which linguistics can be relevant to schools. First, ideas from linguistics can be applied to influence curriculum development and classroom practice. Second, topics in linguistics can themselves be taught and studied. There is disagreement, among linguists and among non-linguists, about the extent to which linguistics is relevant to education and there is variation around the world both in the extent to which linguistics is applied and in the extent to which it is taught.

Applying linguistics

In principle, the work of linguists is relevant to all educational activities, since all educational

activities involve spoken, written or signed language. The relevance of linguistics is more obvious where the subject being studied is itself language-related, e.g., in teaching particular languages or in developing linguistic abilities such as speaking, reading or writing, but research has been carried out and applied in many areas of schoolwork. A well-known example is Bernstein's (1971, 1972, 1973) work on 'restricted' and 'elaborated' codes which raised important issues about the ways in which language usage by teachers and pupils can affect pupil achievement. A more recent example involves the use of **synthetic phonics** in teaching children how to read. A report by Johnston and Watson (2005) of a longitudinal study in Clackmannanshire in Scotland played a key role in the adoption of synthetic phonics in Scotland and, later, England (see Wyse and Styles 2007 for discussion).

Debates about the relevance of particular studies focus not only on questions about the reliability of the evidence but also on the ways in which it is interpreted and applied. For example, some objections to the use of synthetic phonics do not dispute the conclusion that reading abilities for most children develop faster and more effectively with this method. Instead, they point out that this is not the best method for all pupils and take issue with the conclusion that synthetic phonics should be used as a 'one-size-fits-all' approach for all pupils.

Ideas from linguistics have been involved in specific controversial cases in schools. Two famous examples occurred in the USA, at Ann Arbor, Michigan, in 1972 and at Oakland, California, in 1996. The Ann Arbor case involved a family who sued the local authority on the grounds that their daughter was being discriminated against because she was a speaker of **African-American Vernacular English** or **AAVE** (also known as **Ebonics**). The claim was that use of Standard English at school disadvantaged the pupil. The judge in the case ruled that teachers needed to help AAVE speakers by educating themselves on its rules and discussing differences between AAVE and Standard English with students. In Oakland, a school board adopted a policy designed to help speakers of Ebonics by educating teachers on the differences between Ebonics and Standard English. Both cases were controversial, partly based on a misunderstanding of the policies being advocated. Some members of the public were under the false impression that the use of AAVE/Ebonics was being imposed in classrooms. (For further discussion of AAVE/Ebonics, see Green 2002; Perry and Delpit 1998; Ramirez et al. 2005; Williams 1975).

Teaching linguistics

Apart from the term 'linguistics' itself, there are a number of other labels under which topics from linguistics might be taught in schools, including 'grammar', 'language' (including work on specific languages), 'knowledge about language' (often abbreviated as 'KAL') and 'language awareness'. A number of questions recur as issues when plans are made to include any of these topics in a curriculum, including:

1. How is the inclusion of this topic justified?
2. Who will teach it and how?
3. What will the materials be like?

Study of topics from linguistics has often been justified with reference to claimed improvements in other areas, e.g., in language learning, reading or writing. This has sometimes been problematic as it is not clear that research results consistently support a link between work on linguistics and performance in other areas. There has been considerable focus, for example, on the extent to which grammar teaching can help pupils develop their writing abilities, but the evidence on this is not conclusive (see Hudson 2001 and 2004 for discussion). Arguments have also been made on the basis simply that the existence of language and linguistic knowledge makes them a legitimate object of study. Walmsley (1984: 6), for example, suggests that it is as legitimate to study aspects of our linguistic environment as it is to study other aspects of our environment:

> We can surely agree that we live, grow up and work in a particular environment, or a series of environments, and that one of the functions of education is to explain his or her environment to the individual learner … Why should our pupils not study

their linguistic environment just as they study Biology, History, Geography, etc.?

Some arguments against the teaching of both linguistics in general and also grammar in particular have been based on the view that it does not help with work in other areas. It has also been argued that it is positively unhelpful in that it stifles creativity and that it is unnecessary since language abilities develop independently from explicit instruction.

The delivery of any part of a curriculum depends on the availability of teachers who are confident to teach it. It is hard to build a convincing argument for the inclusion of a particular topic if teachers are not available to deliver it or if teachers do not have the training or resources to deliver it in the way envisaged. The successful delivery of particular content also depends on materials which can engage students and which can enable them to develop the required knowledge and skills. These issues affect all of the possible ways in which linguistics might appear in a curriculum.

While linguistics is not a traditional school subject, there is a tradition of grammar teaching at schools which goes back thousands of years. Grammar teaching has moved in and out of favour in particular countries at particular times. In several English-speaking countries (Britain, the USA, Australia, New Zealand), there was relatively little grammar teaching towards the end of the twentieth century compared to other countries in Europe and around the world. In England, grammar returned to the school curriculum in the 1990s after having been dropped in the 1960s and 1970s. There has been continuing debate about whether this is a good thing.

Grammar has occasionally been a focus for more general kinds of argument, e.g., about standards in society. In such cases, a connection is made between understanding of grammar and society's general moral state. Cameron (1995: 78–115), for example, explores how politicians in Britain in the 1980s and early 1990s made a connection between a perceived decline in moral standards and a decline in knowledge of grammar.

Topics from linguistics, including grammar, are sometimes taught within classes on second languages and some first-language work also involves topics from linguistics. In England, the **A** (**Advanced**) **Level English Language**, which includes topics from linguistics, has grown steadily in popularity since its introduction in the early 1980s and in 2005 was the eleventh most popular A Level in England (Hudson 2007a: 229). This A Level was the model for the **VCE** ('**Victorian Certificate of Education**') **English Language** which was introduced in Victoria, Australia in 2001 and is increasingly popular (see Mulder 2007 for discussion).

One specific recurring debate about language in schools concerns the teaching of standard languages. Since most approaches to linguistics focus on description (and explanation) rather than on prescription, it is often assumed that linguistics is in opposition to the traditional practice of teaching pupils to use and understand standard varieties. This perception is perhaps reinforced by the fact that some linguists have suggested that **standard languages** tend to deviate from properties of languages in general. To take one example from English, the past tense forms of the verb *to be* seem to combine elements of a paradigm with inflected endings (not all of the endings are the same) and elements of a paradigm with uninflected endings (not all of the endings are different) while non-standard varieties tend to be more consistent in being uninflected (all endings are the same):

		Variety	
Person	Standard	Non-standard 1	Non-standard 2
I	was	was	were
You	were	was	were
He/she/it	was	was	were
We	were	was	were
You	were	was	were
They	were	was	were

Old English had rich inflectional paradigms (many different kinds of word endings) and relatively free word order. In the move towards Modern English, word order became fixed and word endings became more uniform. On standard assumptions about the development of languages, we would expect differences in word endings to disappear now that the roles played by particular words are signalled by the relatively fixed word order. This has indeed happened

with the **non-standard varieties** represented here, where all of the past-tense forms are the same. The standard variety is unusual in that some differences remain. Facts like these have led linguists to term **standard varieties** 'unnatural' in contrast to the 'natural' non-standard varieties (for discussion, see Emonds 1986; Sobin 1999). At the same time, some recent empirical work suggests that non-standard varieties are not always as regular as this picture would suggest (for discussion of relevant data from a dialect of English spoken around Buckie in north-east Scotland, see Adger 2006, 2007; Hudson 2007b). The suggestion that standard varieties are less 'natural' than non-standard varieties has in turn led to the perception that linguists oppose the teaching of standard varieties, and even that linguists argue for an 'anything goes' approach where all forms of language are seen as equally acceptable. But this is not generally true. Many linguists argue, rather, that standard varieties should be taught and that teachers should be aware of the peculiar qualities of the standard varieties and the particular problems these peculiarities cause for pupils learning standard languages. Chomsky, for example, supports the explicit teaching of standard languages (Olson et al. 1991: 30):

> I would certainly think that students ought to know the standard literary language with all its conventions, its absurdities, its artificial conventions, and so on because that's a real cultural system. They should certainly know it and be inside it and be able to use it freely … You don't have to teach people their native language because it grows in their minds, but if you want people to say 'He and I were here' and not 'Him and me were here', then you have to teach them because it's probably wrong.

In England, this is reflected in the 1999 National Curriculum (DfES 1999). Students are taught that no variety is *linguistically* inferior or superior to another while also studying features of Standard English and developing their awareness of which varieties are appropriate in which contexts.

Language awareness and **KAL** are related but distinct. The idea behind language awareness (Hawkins 1987, 1994, 1999, 2005; Carter 1994) is 'that children should become aware of language as a phenomenon worth studying in its own right' (Hudson 2007a: 233). Hawkins (1994: 413) describes it as 'a movement … which seeks to stimulate curiosity about language' and which 'also aims to integrate the different kinds of language teaching met at school'. It is now a significant international movement with its own association (the Association for Language Awareness, http://www.languageawareness.org) and scholarly journal (*Language Awareness*, http://www.tandf.co.uk/journals/0965–8416). Language-awareness work features in many curricula around the world. Topics covered under the heading of language awareness include very broad questions about the nature of human language and languages as well as more specific exercises which focus on particular aspects of languages such as phonological systems, spelling, morphology and syntax. As Hudson (2007a: 234) puts it, KAL 'is the name for the idea that language teaching should be explicit and should therefore impart some knowledge about the structure of language and a metalanguage for talking about it – precisely the kind of knowledge that linguists can provide.'

The assumption here is that language learning requires explicit focus on features of languages. It is not enough to expose students to languages and allow their knowledge to develop 'naturally'. As Hudson (2007a) points out, this contradicts the assumptions of many linguists who believe that language acquisition does not require explicit instruction.

In England, KAL is now an explicit part of the curriculum for English (Anon. 1999) and the Key Stage 2 Framework for Languages (Anon. 2005).

Linguistics is taught at school under the heading of **linguistics** in some countries, including, for example, Germany, Kazakhstan and Russia. Partly based on the success of the A Level in English Language, and partly based on a perceived interest among students and teachers, a group of educators in England is working towards the development of an **A Level in Linguistics** (see Hudson 2007c for more information). Classroom materials on linguistics continue to be developed in a number of places around the world. In Serbia, Ranko

Bugarski (1983) produced a textbook for use in secondary schools which has proved very popular with pupils. In Denmark, the **VISL** ('**Visual Interactive Syntax Learning**') project has produced a range of materials for teaching grammar at schools (http://visl.sdu.dk). Further examples can be found in recent publications by Denham (2007), Denham and Lobeck (2005, 2008), Gordon (2005) and Mulder (2007).

Starting in the 1960s, '**Linguistics Olympiads**' have been run in Russia, Bulgaria, Estonia, the Netherlands and, more recently, in the USA (see http://www.phon.ucl.ac.uk/home/dick/ec/olympiad.htm for further information and links to the sites of individual olympiads). These are extracurricular activities in the form of competitions in which high-school students compete in solving problems of linguistic analysis. The existence of the olympiads is evidence of interest in, and enjoyment of, work on linguistics at school.

B. C.

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M

Metaphor

Metaphor, traditionally considered a figure of speech, one trope among others such as synecdoche, understatement, hyperbole, is also clearly a matter of thought. Metaphor is thinking of one thing (A) as though it were another thing (B), and results linguistically in applying an item of vocabulary or larger stretch of text in an unconventional way (including unusual reference, collocation, predication, modification or complementation). In traditional terminology, A is the topic/target and B is the vehicle/source. Metaphorical thinking involves establishing some similarity or analogy linking A and B. This process is mapping, and the similarities or analogical relationships are the grounds. In the famous metaphor from J.P. Hartley's *The Go-Between* (1958), 'The past is a foreign country; they do things differently there', these three elements of metaphor are all specified. The target is the topic we are literally talking about, 'the past'. The source is the entity with which the target is being compared 'a foreign country'. The ground, the similarity mapping features across them is 'they do things differently there'.

Such full specification is not always provided textually. Metaphors such as *mouse* which label a new entity, the computer attachment, only mention the source. Metaphorical sources may be realised by various phrase types, not just nominals, as in the Hartley example, but adjectives, verbs and even adverbs (*to think highly of*) or prepositions (*to be in trouble*). With these word classes the source itself may not be fully specified. When Matthew Arnold in 'Dover Beach' refers to 'the naked shingles of the world', he evokes the usual collocate of *naked*, *body*, and then explores the similarities/analogies between a naked body and a shingle beach when the tide is out. Similarly, conventional metaphors like 'invest time' suggest that the source of the metaphor is money. The underlying conceptual metaphor here can be labelled TIME IS MONEY.

As metaphor is a matter of thought it may have a pictorial (Forceville 1996) or other symbolic realisation: the chains at the foot of the Statue of Liberty realise NO FREEDOM IS TYING/BINDING (Kövecses 2002); and placing bargains in the bargain basement realises LESS IS LOW.

Functions

Cognitive linguists emphasise metaphors' conceptual or ideational functions. These include filling lexical gaps (*mouse*), explanation (electricity is compared with waterflow), scientific modelling (light is modelled as wave or particle), ideology (a woman may be referred to as a *tart* or *cheesecake*). However, metaphors may have interpersonal and textual functions as well. Interpersonally they may create intimacy (or exclude), in cases where the source and/or grounds are only understood by a select few (Cohen 1979), or express emotion, most obviously in swearing metaphors with affective grounds (*shit*, *turd*, *piss off*). Textually, metaphors may help to frame a text by clustering at certain stages of discourse, such as summaries in teacher discourse (Cameron 2003), organise the development of a paragraph, or enhance memorability through their foregrounding (Goatly 1997).

Degrees of metaphoricity

Problems of defining or identifying metaphor arise because there are clines of metaphoricity (Mooij 1976), especially involving similarity and originality. Some theorists see approximation and metaphor as endpoints of a similarity continuum (Sperber and Wilson 1995). Prototypical metaphors are original, like Hartley's 'foreign country', but others become conventionalised as part of the lexicon, e.g., *mouse*. They may disappear over time, either because their source is no longer available – the particular kind of spiced fish known as a red herring no longer exists, obscuring its metaphorical origin, or simply because they are lexicalised and institutionalised – 'damage your foot' (rather than 'injure'), metaphorical in the 1970s, now seems quite normal. Metaphor contributes to word formation [*see* MORPHOLOGY], not only by extending the senses of words such as *mouse*, but by involvement in derivation through affixation – *hash* (literal meaning), *rehash* (metaphorical meaning), or compounding – *frogman*, *hare lip*, etc.

There is conflicting experimental evidence about whether conventional metaphors (or metaphorical idioms like *blow one's top*) are processed differently from original metaphors (Gibbs 1992). That unconventional metaphors show more right-hemisphere brain activity than conventional ones in fMRI brain scans (Ahrens et al. 2007) might suggest qualitative differences (Steen 2007: 67–8). For instance, interpreting 'Universities are facing financial cuts', simply involves disambiguation of the two dictionary meanings of 'cut', ignoring the grounds. However, interpreting the lines from 'Death of a Poet' 'His tractor of blood stopped thumping / He held five icicles in each hand' (Causley 1973: 495) means establishing the target to which 'tractor' and 'icicles' refer, i.e. the heart and fingers, and discovering the grounds – a heart pulls the blood around the body just as a tractor pulls machinery around a farm, fingers and icicles are long, thin, and pointed, and dead man's fingers are cold and stiff like icicles. Recent theories acknowledge that processing differs between novel and conventional metaphors, for example 'the career of metaphor' approach (Gentner and Bowdle 2001).

Interpretation and theory

Because metaphor undermines the stability of the code by bringing about temporary or permanent changes of meaning it was a challenge to traditional synchronic linguistic/semantic theory whether functional or generative, and much twentieth-century theorising and experimentation was left to philosophers or psychologists. The linguistic substitution theory (Bickerton 1969) suggested that an (imagined) property of the source constituted the meaning of the metaphorical term, so that in 'he is a rat' 'rat' substitutes for 'disloyal'. Modern class-inclusion theory (Glucksberg and McGlone 1999) using similar copula metaphors made up for psychological test purposes, shares the idea that a property of the source is attributed to the target (because the source is a typical exemplar of a superordinate category). Interaction theory (Black 1962) and the later blending theory (Turner 1996; Fauconnier 1997) suggest that features of target and source involved in the similarity/analogy are not necessarily pre-existent features of either but emerge or are created during their interaction: in 'the surgeon is a butcher' incompetence is neither an antecedent property of surgeon nor butcher. Though interaction/blending seem to contest the role of similarity/comparison, they are in fact compatible (Mooij 1976: 171; Steen 2007: 61–4). Moreover, similarity/analogy is necessary for distinguishing metaphor from metonymy, being better than the separate/identical domain criterion, as the latter excludes interpretations of paradoxical metaphors like Wordsworth's 'the child is father of the man' (father:child::child:man; just as the child manifests traits observable in his father, so a man manifests traits observable when he was a child).

Early linguistic attempts to explain metaphor in semantic terms (Levin 1977), detecting metaphors through selectional restriction violation, acknowledged the need for pragmatic accounts [*see* PRAGMATICS]. The maxims of the Gricean cooperative principle seem to be flouted by metaphors (Grice 1975), not only the more obvious quality ('the past is a foreign country' is blatantly untrue), but manner (metaphors are often obscure/ambiguous), and possibly relation (why talk about a mouse when the topic is

computers?), and quantity too (taken literally the metaphor conveys very little information). And the ensuing interpretative inferential processes are usefully formalised in terms of deductive logic (Sperber and Wilson 1995; Goatly 1997).

Conceptual metaphor theory, a branch of cognitive linguistics [*see* COGNITIVE LINGUISTICS], originates with Weinreich (1963), but it announced itself with Lakoff and Johnson's *Metaphors We Live By* (1980). One emphasis is upon the ubiquity of metaphor (Paprotté and Dirven 1985) even in philosophical denunciations of metaphors which 'insinuate wrong ideas, move the passions, and thereby mislead the judgment, and so indeed are perfect cheat' (Locke 1961: Book 3, p. 105). The theory's strong claim is that abstract thought is only possible through the use of metaphor; even mathematical concepts like Boolean logic depend on the container metaphor, with set members inside and non-members outside (Lakoff 1987a: Chapter 20).

This theory also emphasises that concrete sources for abstract targets fall into patterns involving elaboration of parts of the source schema, and mapping across the schemas. For example there is plenty of lexical evidence for (competitive) activity being conceptualised in a consistent way as a race (see Table 1).

According to Lakoff's 'experientialist hypothesis' (1987a) the sources of conceptual metaphors derive from our bodily experiences as infants, whether of our own bodies or external phenomena. Fear makes us experience a drop in body temperature so FEAR/UNPLEASANT EMOTION IS COLD. Anger and passion raise it, so ANGER IS HEAT, LOVE/PASSION IS HEAT. Our muscles tense with anxiety, so NERVOUSNESS IS TENSION. We look down/slump when we are sad, so SAD IS LOW, etc. (Kövecses 2000; Damasio 2003). Externally, the more objects in a pile the higher it becomes, so MORE IS HIGH, LESS IS LOW, INCREASE IS RISE, DECREASE IS FALL. Because these sources and targets are contiguous in our experience their relation is metonymic. For example, anger causes body heat, but this metonymy is later developed metaphorically, when anger can *smoulder* or *flare up*.

Because not all aspects of the source schema are lexically elaborated in every conceptual metaphor Grady posited the more elegant theory of primary metaphors. Metonymic correlations in universal subjective experience become, through generalisation, the motivation for primary metaphors, which provide components for many conceptual metaphors. For example, the primary metaphors ORGANISATION IS PHYSICAL STRUCTURE and VIABILITY IS ERECTNESS combine within THEORIES ARE BUILDINGS, accounting for the fact that we can buttress an argument or talk about its foundations, but not about the rooms in it (Grady 1997).

Recent developments

The cognitive linguistic theory of metaphor, much of it universalist and intuitive in tendency, has provoked challenges and developments within lexicology/corpus linguistics and text-linguistics/discourse analysis. Some researchers have addressed the demands for systematic lexicological [*see* LEXIS AND LEXICOLOGY] work to establish thesauri of lexis (Wilkinson 2002) and to group them according to conceptual metaphors (Deignan 1995; Metalude 2004). Corpus or dictionary data challenge the importance of many of the accepted conceptual metaphors in

Table 1 Metaphorical lexis for (COMPETITIVE) ACTIVITY IS RACE

Sub-schemas for competitive activity	*Vocabulary*
participants	*the field*
start	*from the word go, jump the gun, a head start, quick/slow off the mark*
advantage	*jockey for position, inside track*
effort	*stand the pace, a breather, second wind*
failing	*get behind, lag behind*
capability, equality	*keep up with, close the gap on, catch up with*
succeeding	*streets ahead, frontrunner, outdistance*
finishing	*pipped at the post, down to the wire*
assessment	*track record, also ran*

the cognitive linguistic literature, for example ANGER IS HOT FLUID IN A CONTAINER (Deignan 2007; Goatly 2007). Incidentally, thesauri can have practical spin-offs in teaching vocabulary, exploiting the mnemonic potential of metaphorical imagery (Boers 2000). Deignan's corpus work [*see* CORPUS LINGUISTICS] also shows restrictions on mapping, not explained by Grady, tendencies for metaphor to occur in compounds and extensions, for different word classes to be instantiated when used metaphorically rather than literally, all of which tendencies combine to reduce the potential ambiguity of conventional metaphors (Deignan 2007).

The early emphasis on universalism predicated on bodily experience has lately been balanced by emphasis on the cultural origins and varieties of metaphor themes, for instance in the medieval theories of the four humours (Geeraerts and Grondelaars 1995). More generally, themes may vary across languages and cultures due to different bodily experiences, interests and histories (Kövecses 2005). Indeed, many metaphor themes seem to be implicated in capitalist and neo-conservative ideology (Lakoff 1996; Goatly 2007), e.g., QUALITY IS MONEY/WEALTH, TIME IS MONEY/COMMODITY, and (COMPETITIVE) ACTIVITY IS A RACE.

Moving from lexicology to (critical) discourse analysis, interesting work has been carried out in the analysis of metaphors in the classroom (Cameron 2003) and politics [*see* CRITICAL DISCOURSE ANALYSIS]. As part of the critical metaphor analysis project, Charteris-Black (2005) demonstrates, from political speeches, the importance of metaphor to leadership in mediating between the conscious/rational and unconscious/emotive elements of ideology. Musolff (2004) has shown how the 'same' metaphor may be reworked in different discoursal contexts.

The tradition of analysing naturally occurring metaphors in extensive texts from a linguistic standpoint develops from Brooke-Rose (1958), quantifying the different syntactic expressions of metaphor, through Steen (1994), showing how different kinds of (good) interpretation were associated with different genres, an insight built on in Goatly (1997), relating genre to the degrees and kinds of textual realisation, signalling and extension of metaphor [*see* GENRE ANALYSIS]. Lately several studies have focused on the problem of metaphor identification (Pragglejazz Group 2007; Steen 2007). The latter work also attempts to bring some methodological order into the diverse fields of metaphor research, distinguishing metaphor as grammar or usage, symbol or behaviour and thought or language.

A. P. G.

Suggestions for further reading

Deignan, A. (2005) *Metaphor and Corpus Linguistics*, Amsterdam: Benjamins.
Gibbs, R.W. (2008) *The Cambridge Handbook of Metaphor and Thought*, Cambridge: Cambridge University Press.
Goatly, A. (1997) *The Language of Metaphors*, London: Routledge.
Lakoff, G. (1996) *Moral Politics: What Conservatives Know that Liberals Don't*, Chicago, Ill., and London: University of Chicago Press.
Steen, G. (2007) *Finding Metaphor in Grammar and Usage*, Amsterdam: Benjamins.

Morphology

Background and basic terms

While syntax is concerned with how words are arranged into constructions, **morphology** is concerned with the forms of words themselves. The term has been used by linguists for over a century, although opinions have varied as to precise definitions of the subject area and scope. Interest in classifying language families across the world in the nineteenth century [*see* HISTORICAL LINGUISTICS] led to the study of how languages were differently structured both in broad and narrower ways, from the general laws of structure to the study of significant elements such as prefixes and inflections (see Farrar 1870: 160; Lloyd 1896). In the twentieth century the field has narrowed to the study of the internal structure of words, but definitions still vary in detail (see Bloomfield 1933: 207; Nida 1946: 1; Matthews 1974: 3; Spencer 1991; Carstairs-McCarthy 1992; Booij 2005).

Most linguists agree that morphology is the study of the meaningful parts of words, but there have broadly been two ways of looking at the overall role played by these meaningful parts of words in language. One way has been to play

down the status of the word itself and to look at the role of its parts in the overall syntax; the other has been to focus on the word as a central unit.

Whichever way is chosen, all linguists agree that within words, meaningful elements can be perceived. Thus in the English word *watched*, two bits of meaning are present: 'watch' plus past tense. 'Watch' and past tense are generally called **morphemes**. In the word *pens* two morphemes 'pen' and plural are present. A word such as *unhelpful* has three morphemes: negative + 'help' + adjective. The forms that represent 'negative', plural and adjective *(in-*, *-s* and *-ful)* are usually called **morphs** (see Hockett 1947). We can represent the examples as shown in Table 1.

In theories where the word is an important unit, morphology therefore becomes the description of 'morphemes and their patterns of occurrence within the word' (Allerton 1979: 47). In the American structuralist tradition interest lay more in the morpheme as the basic unit in syntax rather than in its role within the word; Harris (1946), for example, recognised only 'morphemes and sequences of morphemes' and eschewed the word as a unit of description. While this sidesteps the problem of defining the word, the morpheme itself has also presented difficulties of definition and identification. Bloomfield (1926: 27) describes the morpheme as 'a recurrent (meaningful) form which cannot in turn be analysed into smaller recurrent (meaningful) forms. Hence any unanalysable word or formative is a morpheme'. The problem is: what is meaningful?

What is more, recurrent forms in themselves are also problematic. Nida (1946: 79) said that morphemes are recognised by 'different partial resemblances between expressions', which enables us to identify a common morpheme PAST in *sailed*, *landed* and *watched*, and a common morpheme SAIL in *sails*, *sailing*, *sailor*, *sail* and *sailed*. PAST and SAIL are both 'meaningful' and are established by noting the recurrent pieces of word forms (Robins 1980: 155), in this case the morphs written as *-ed* and *sail*. However, the following examples from English show that there are serious problems with this approach (after Allerton 1979: 49–50):

1. disarrange, disorganise;
2. discern, discuss;
3. dismay, disgruntle;
4. disappoint, disclose.

Group 1 are clearly *morpheme* + *morpheme* words (they contain recurrent *and* meaningful parts). Group 2 cannot be analysed into parts and so represent single morphemes. Group 3 seem to have some sense of 'disturbance of a state' in their *dis-* element, but the parts *-may* and *-gruntle* can then only be labelled as **unique morphemes** in that they do not reoccur elsewhere. Group 4 looks superficially like Group 1, but the parts *-appoint* and *-close* bear no meaningful relation to the morphemes APPOINT and CLOSE which appear elsewhere as separate words. Group 4 therefore contains **pseudomorphemes**.

Bloomfield (1933/1935: 244) had also noted what he called **phonetic-semantic resemblances** between recurrent parts of words which occur in very limited sets and yet do not seem to have any specifiable meaning nor any meaning at all beyond the limited set, for example:

/ð/ in *this*, *that*, *then*, *there*
/n/ in *not*, *neither*, *no*, *never*
/fl/ *in flash*, *flicker*, *flame*, *flare*
/sn/ in *sniff*, *snort*, *snore*, *snot*

Other problems in labelling morphemes include variations of meaning within a single recurrent form (Bazell 1949), which is evident in the English element *-er* in *leader* ('one who leads'), *dresser* (not 'one who dresses' when referring to a piece of furniture), and meaningfully related forms

Table 1

Words	*Morphs*	*Morphemes*
watched	watch-ed	WATCH + PAST
pens	pen-s	PEN + PLURAL
unhelpful	un-help-ful	NEGATIVE + HELP + ADJECTIVE

that have no phonetic resemblance (e.g., *go/went*, *city/urban*). The problems are basically those of trying to relate forms and meanings, and morphologists have never fully resolved them. Bolinger (1948) calls the morpheme 'scarcely easier to pin down than a word' and sees one of the main problems as being the separation of **etymology** which is rightly the study of how present-day words came to be formed in the past, and the description of the structure of words. Thus **diachronic morphology** will be interested in the elements that originally built words such as *disease* and *away*, words which to the vast majority of present-day English speakers would consist of a single morpheme each.

Bolinger, and after him Haas (1960), also recognised the difficulty of trying to identify morphemes on purely formal (distributional) grounds: for how does one separate the *cat* in *pussycat* from *cat* in *cattle*, or the *re-* in *recall* and *religion?* Bolinger's solution is that the morpheme be rather pragmatically defined as what the majority of speakers can recognise as one, or as the smallest element that can enter into *new* combinations (i.e. that an element must be **productive**). This enables us to dispense with 'meaning' and concentrate on 'a measurable fact, the recurring appearance in new environments' (Bolinger 1965a: 187). This approach certainly clears away niggling difficulties such as any apparent relationship between the word *stand* and its purely formal recurrence in *understand* and *withstand* (which form their past like *stand* but have no obvious present-day connection and are not part of a productive set) (see Makkai 1978); it also rules out the *cran* of *cranberry* from having the status of a morpheme. But problems remain: a cranberry *is* opposed in meaning to a strawberry or a loganberry, and so the elements preceding *-berry* certainly have some 'significance'. (On productivity see also Haspelmath 2002: Chapter 6.)

One solution is to see morphemes as only having true significance in relation to the words they appear in and so to make the word absolutely central to morphology. Such an approach is seen in Aronoff (1976: 10). Whatever the case, there do seem to be strong arguments for separating **synchronic** from **diachronic** studies, for without such a separation, the difficulties become insurmountable. To rescue the morpheme as a manageable unit it is also clear that neither form nor meaning alone are entirely reliable but must be wed in a compromise. The arbitrariness of meaning will persist in providing inconsistencies such as *selection* (act of selecting/things selected) compared with *election* (act of electing/*people elected) (Matthews 1974: 50–l), but linguists continue to seek statements that will express underlying meanings for apparently unrelated forms (e.g., Bybee 1985: 4; Booij 1986). It will generally be the case, though, that morphemes will be identified by an accumulation of formal and semantic criteria. Such criteria can be seen in operation in Nida's (1946) principle for identifying morphemes. (See also Spencer 1991: 4ff. for a summary and discussion.)

However, the morpheme will often be recognised by semantic and distributional criteria without its form being identical. A clear example is the formation of plurals in English. If we compare the final elements in *hands* [z], *cats* [s], and *matches* [z], we can observe a common meaning (PLURAL), a common distribution (distinct from that of the present-tense-*s* of verbs, such as *sees*, *writes*, etc.) and phonological resemblances. So, just as the sound [ɬ] in *bottle* does not contrast in *meaning* anywhere in English with the sound [l] in *lamp*, nor does [hændz] ever contrast with a word [hændɪz]; and just as we talk of the **phoneme** /l/ being realised by two **allophones** [*see* PHONEMICS], so the **morpheme** PLURAL is realised by different **allomorphs** (/-z/, /-s/, and /-ɪz/). Similarly, the English PAST morpheme has its allomorphs in the different realisations of *-ed* in *hooked* /t/, *raised* /d/, and *landed* /ɪd/.

Another way of looking at allomorphs is to say that the allomorphs of the English morpheme PLURAL alternate between /s/, /z/, and /ɪz/ and that these are three different **alternants** (see Matthews 1974: 85ff.). Alternation is usually studied in terms of the type of conditioning that brings it about. For instance, the English PLURAL allomorphs mentioned are **phonologically conditioned**: they follow the same rules as the allomorphs of present-tense third-person singular *-s* and the 's possessive (Bloomfield 1933: 211). Whether a past participle ends in *-en* or *-ed*, however, is not determined by phonology and is thus said to be **morphologically conditioned**.

But the notion of allomorphs and alternation raises a further problem. *Sheep* can be singular or plural, and *put* is the present, past, or past participle of the verb. To overcome this difficulty, some linguists have proposed the existence of a **zero morph** (written Ø) Then, in the case of English plurals, Ø would be one allomorph of the morpheme PLURAL, alternating with /s/, /z/, and /ɪz/. Likewise Ø would be an allomorph of PAST, alternating with /t/, /d/, and /ɪd/. Nida (1946: 3) justifies this approach by saying that the absence of an ending in verbs like *hit* and *cut* is 'structurally as distinctive as the presence of one', but other linguists have seriously challenged the viability of Ø as a linguistic element. Haas (1960) calls zero allomorphs 'ghostly components' and Matthews (1974: 117) says incisively 'one cannot examine one's data and determine the "distribution" of "zero"'.

Not only this, but Ø does not solve the problem of the existence of other plurals such as *man/men* and *foot/feet*, or past tenses such as *drink/drank* and *sing/sang*. An alternative, therefore, is to talk of **morphological processes**, whereby the individual elements (e.g., MAN + PLURAL) interact to form a unified product, *men*, and are in no way obliged to represent the segments as a **sequence** of morphemes (Matthews 1974: 122–3). This approach enables the analyst to dispense with the notion of allomorphs and to dispense with Ø: HIT + PAST simply interact to give the unified form *hit*, while SING + PAST interact to produce *sang*.

Morphemes and the morphs that represent them are, however, clearly of different types. In the word *repainted*, the morph *paint* can stand alone as a word and is therefore a **free morph**; *re* and *-ed* cannot stand alone and are therefore **bound morphs**. Another distinction is often made between (1) morphs such as *head*, *line*, *-ist* and *de-*, which can be used in the creation of new words (e.g., *headline*, *economist*, *depopulate*), which are called **lexical morphs**, and (2) those which simply represent grammatical categories such as person, tense, number, definiteness, etc., which are called **grammatical morphs**.

Lexical morphs which are not of the kind *-ist* and *de-* but which form the 'core' of a word (Booij 2005: 28), such as *help* in *unhelpful* or *build* in *rebuild* are known as **roots**. The root is that part of the word which is left when all the **affixes**, that is, all the morphs that have been added to it, whether before or after it (such as *de-*, *er-*, *-ist*, *-mg*, *-ed*, etc.) are taken away. The root is central to the building of new words. Not all roots can stand as free words, however: in the series *dentist*, *dental*, *dentures*, there is certainly a root to which various morphs are added to produce nouns and adjectives, but there is no free morph *dent* which represents the morpheme *of the teeth*. So some roots are **bound** (*econom-*, as in *economist*, *economy*, *economic* is another example). Not all linguists agree precisely on the definition of the term, 'root' (for example, Malkiel [1978] prefers to talk of **primitives**), but for most purposes it may be conveniently thought of as the **core** or unanalysable centre of a word. Affixes are divided into **prefixes**, occurring at the beginnings of words, and **suffixes**, occurring at the end of words. **Infixes**, morphs inserted within other morphs, also exist in some languages. See Spencer (1991, 2001) on the relationship between roots and affixes.

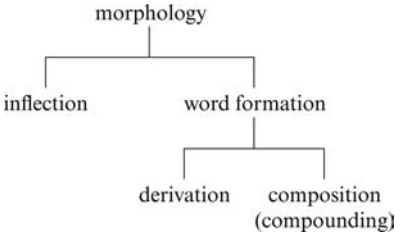
The scope of morphology

The different approaches to identifying morphemes and to the relationships between morphemes and words are reflections of different major trends in linguistics during the twentieth century, but most linguists are in agreement on the type of phenomena morphology is concerned with. A sample of English words will illustrate these areas:

5. locates, locating, located;
6. location, locative, dislocate;
7. earache, workload, time-bomb.

In Group 5, the suffixes realise morphemes such as PRESENT, PAST, PRESENT PARTICIPLE, etc. but do not change the nature of *locate* as a verb; morphemes such as PRESENT, PAST, PLURAL, THIRD PERSON, and so on, are called **inflectional morphemes**. **Inflection** is a major category of morphology (see Matthews 1972). Group 6 adds bound morphs to *locate* which change its word class and enable us to **derive** new words (an adjective, a noun and a verb with opposite meaning). The process of adding bound morphs to create new words of the same or different word classes is

called **derivation**. Group 7 shows examples of words which are made by combining two free roots (e.g., *ear* + *ache*). This is called **composition** or **compounding** and *earache*, *workload*, and *time-bomb* are compounds. Groups 6 and 7 are different from 5, then, in that they enable new words to be formed; they are examples of word formation, and the scope of morphology may be represented in the following way (see Bauer 1983: 34):



Inflection

Bloomfield (1933: 222) referred to inflection as the outer layer of the morphology of word forms and derivation as the inner layer. A simple example to illustrate what he meant by this is that the natural morphemic segmentation of the word form *stewardesses* is as in (8), not as in (9) below:

8. stewardess + es
9. *steward + esses

In other words, inflections are added when all derivational and compositional processes are already complete. The plural forms of *motorbike* and *painter* are *motorbikes* and *painters*, not **motorsbike* and **paintser*. Inflections such as tense, number, person, etc. will be attached to stems, forms which may already have derivational affixes. Examples of stems are *repaint* (which can yield *repaints*, *repainted*, etc.) and *computerise* (which can give *computerised*, *computerising*, etc.). The various terms can be related by the following example of some possible forms of the root *paint:*

root	*paint*
affixes	*(re-)paint(-ed)*
stem	*repaint(-ed)*
morphs	*re-paint-ed*
morphemes	*AGAIN-PAINT-PAST*

Inflectional categories such as tense, voice, and number play an important role in syntax and are called **morphosyntactic categories**, since they affect both the words around them and the words within which they occur (see Matthews 1974: 66). Inflectional morphemes are very productive: the third-person singular present tense *-s* can be attached to any new English verb; the same cannot necessarily be said about derivational affixes (we can say *rework* and *dismissive* but not **rebe* or **wantive*, for example). Inflectional morphemes are semantically more regular than derivational ones: meaning will remain constant across a wide distributional range. Inflections create full conjugations and declensions for verbs and nouns; unlike derivations they usually do not produce 'gaps': whereas the past inflectional morph *-ed* can be attached to any of the verbs *arrive*, *dispose*, *approve* and *improve* in English, only the first three form nouns with the *-al* suffix.

Word formation

A general distinction can be drawn between derivation and composition (compounding).

Derivation

Derivation, like inflection, consists of adding to a root or stem an affix or affixes. But while new inflections occur only very slowly over time, new derivational affixes seem to occur from time to time, principally in that speakers use elements of words that are not established as affixes in a way that makes them like established, productive ones (e.g., English *sputnik*, *beatnik*, *refusenik; alcoholic*, *workaholic*, *radioholic;* see Adams 1973: 139, for further examples). Matthews (1984) gives a good summary of the arguments concerned in the separation of inflection from derivation.

Derivational affixes produce new words; their function is not to express morphosyntactic categories but to make new words. They are somewhat erratic in meaning and distribution: the suffix *-al* that creates nouns from verbs such as *arrive* and *dispose* forms adjectives from the nouns *brute* and *option*. What is more, whereas *nasal* means 'of the nose', *brutal* means 'like a brute' and *optional* means that something *'is* an option'. Derivational affixes vary in their productivity: English nouns ending in *-hood* are few

and new ones are unlikely, but the *-ist* in *communist* is fully productive, as is the *-ise* verb-forming morph (*computerise*, *centralise*). Within derivation, the distinction is often made between **class-maintaining** and **class-changing processes**. Class-changing produces a new word in a different word class (e.g., *computer* [noun] – *computerise* [verb]), while class-maintaining produces a new word but does not change the class (e.g., *child* [noun] – *childhood* [noun]) (but see Bauer 1983: 31–2, for arguments against the distinction). Equally important is the phenomenon of conversion where a word changes word class without any affixation, e.g., *a hoover* (noun) – *to hoover* (verb); *a service* (noun) – *to service* (verb) (see also Bolinger and Sears 1981: 65).

Composition (compounding)

Compounding characteristically combines lexemes into a larger morphological unit. In its simpler form, two independent words combine to form a new one, and one of the original components modifies the meaning of the other one (Booij 2005: 75). Examples of compounds are *blackmail*, *bathroom*, *skyscraper* and *gearbox*. They function to all intents and purposes like single words: if the room where I have my bath is old it is an *old bathroom*, not a **bath old room*. Like single words they will be spoken with only one primary stress, and any inflectional suffixes will occur at the end of the whole unit (*bathrooms*, not **baths-room*). They occupy full, single grammatical slots in sentences, unlike idioms, which can be a whole clause (Bolinger and Sears 1981: 62). Compounds may contain more than two free roots (e.g., *wastepaper basket*) and in some languages (e.g., Germanic ones) may contain in excess of half a dozen free roots (see Scalise 1984: 34, for examples). Compounds may be formed with elements from any word class but, in English at least, noun + noun compounds are the most common and are very productive, while verb + verb compounds are few.

The following are examples of noun compounds in English according to the form-classes of their components, following Bauer (1983) (for other approaches to classification see Bauer 1983: 202):

noun + noun	bookshelf	football
verb + noun	pickpocket	killjoy
noun + verb	nosebleed	moonshine
adjective + noun	software	slowcoach
particle + noun	in-crowd	aftertaste
verb + particle	clawback	dropout
phrase compounds	gin-and-tonic	forget-me-not

These all function as nouns. Similar constructions can function as verbs. Some combinations are rare, for example, verb + verb functioning overall as a verb (*to freeze-dry*), but the same type (verb + verb) functioning as an adjective seems more productive: Bauer (1983: 211–12) gives the examples of *go-go (dancer)*, *stop-go (economics)*, and *pass-fail (test)*.

Compounds are often divided into four semantic types: **endocentric**, **exocentric**, **appositional**, and **dvandva** (see Bauer 1983: 30–1). Where one element is the grammatical headword and the other one a modifier, as in *wristwatch* (where *wrist* modifies *watch*), the compound is **endocentric**. Endocentric compounds are **hyponyms** [*see* SEMANTICS] of the headword. Where hyponymy of this kind does not exist, as in *scapegoat*, which is a kind of person, not a kind of goat, the compound is **exocentric** (the term **bahuvrihi** is also used for this type). Where the hyponymy is **bidirectional**, as in *sofa-bed*, which is a kind of sofa and/or a kind of bed, or *clock-radio*, which is a kind of clock and/or a kind of radio, these are known as **appositional compounds**. Where compound elements name separate entities neither of which is a hyponym of the other and either of which might seem to be the grammatical headword, then these are **dvandva** or **copulative compounds**, as in names such as *Slater-Walker*, *Austin-Rover*, or *Alsace-Lorraine*.

The type of compounds referred to as **neoclassical compounds** take elements, usually from Greek or Latin, and make words in a way that often resembles derivation but which needs to be kept distinct, for often such elements can combine with each other without any other root being present, and are therefore acting like roots themselves. It is for this reason that they may be considered as similar to compounds. Examples are *anglophile* (cf. *hibernophile*, *francophile*, etc.), *telephone (television*, *telegram)*, *astronaut (cosmonaut)*, *biocrat*. *Anglophile* belongs to a medial *-o* type which includes *sphero-cylindrical*, *socio-political*, *physico-chemical*, etc. (see Adams 1973: 132). For a survey of the types of compounding see Olsen (2000).

Other word-formation types

Backformation occurs when a suffix (or a morph perceived as a suffix) is removed from a complex word; *lecher* → *to lech*, or *liaison* → *to liaise* are English examples; Malkiel (1978) has interesting examples from old Provençal and modern French. Malkiel (1978) also gives examples of **clipping**, which can involve deletion of initial morphemes or final word-segments. *Lab(oratory)*, *(aero)plane*, *(tele)phone*, etc., are examples. Blends are another interesting type of formation, where normally initial and terminal segments of two words are joined together to create a new word, for example, *brunch (breakfast + lunch)*. English examples include *selectorate (selectors + electorate)*, *chunnel (channel + tunnel)*, *fantabulous (fantastic + fabulous)*.

Acronyms, words formed from the initial letters of a fixed phrase or title, are also popular and often equally short-lived. English examples are *quango* (quasi-autonomous nongovernmental organisation), *misty* (more ideologically sound than you); established acronyms include *NATO*, *SALT* (strategic arms limitation talks) and *radar*.

Word manufacture, the invention of completely new morphs, is rare in comparison to the kinds of word formation described above. One example often cited is *kodak*. Equally, some words appear whose origin is unknown or unclear (the *OED* attests *gazump* from the 1920s onwards with no etymological information) and literary works often contain one-off inventions (see Bauer 1983: 239; Haspelmath 2002: 25).

Word-formation processes are variably productive but constantly in operation to expand the lexicon as new meanings emerge, social and technological change takes place, and individuals create new forms. The advent of computers has given English items like *software* and *firmware*, and an extended meaning of *hardware*, plus a host of other terms. A survey, in the London *Observer* newspaper in 1987, of the professional jargon of young City professionals included compounds such as *Chinese wall*, *concert party*, *dawn raid*, *marzipan set*, and *white knight*, all with specific meanings within the world of financial dealing, as well as acronyms such as *oink* (one income, no kids) and *dinky* (dual income, no kids yet) (*Observer*, 23 March 1987: 51). For a comprehensive discussion of word formation see Štekauer and Lieber (2005).

Morphophonology (or morpho-nology, or morphophonemics)

Morphophonology in its broadest sense is the study of the phonological structure of morphemes (the permitted combinations of phonemes within morphemes in any given language; see Vachek 1933), the phonemic variation which morphemes undergo in combination with one another (e.g., *hoof/hooves* in English), and the study of alternation series (e.g., recurrent changes in phonemes before certain suffixes in English: *electric* → *electricity*, *plastic* → *plasticity; malice* → *malicious*, *pretence* → *pretentious;* see Trubetzkoy 1931). Such changes are from one **phoneme** to another, not just between allophones (see also Trubetzkoy 1929).

The study of such changes is carried out within a morphological framework. Swadesh (1934) points out that the /f/ in *leaf* and the /f/ in *cuff* are phonemically the same but morphologically distinct in that their plurals are formed in /v/ and /f/, respectively. This latter fact can be represented by a morphophonemic symbol /F/, which would represent /v/ before /z/ plural and /f/ elsewhere (Harris 1942; see also Lass 1984: 57–8).

The broad areas covered by morphophonemics in Trubetzkoy's terms have been successively narrowed and rebroadened in linguistics over the years (see Kilbury 1976 for a detailed survey). Hockett (1947) concentrates on 'differences in the phonemic shape of alternants of morphemes' in his definition of morphophonemics, rather than on the phonemic structure of morphemes themselves. Wells (1949) takes a similar line. Hockett (1950) later returns to a broader definition which 'subsumes every phase of the phonemic shape of morphemes', and later still gives morphophonemics a central place in the description of language (Hockett 1958: 137). One of the problems in studying the phonemic composition of alternants is the separation of those alternants whose phonemes differ purely because of phonological rules, those which differ purely on lexico-grammatical grounds and those which might be seen as most narrowly morphophonologically determined (see Matthews 1974: 213, for a critique of these distinctions).

Central to the study of alternation is the notion of **sandhi**, which comes from a Sanskrit word

meaning 'joining' (see Andersen 1986: 1–8, for a general definition). Sandhi rules attempt to account for the phonological modification of forms joined to one another. Matthews (1974) gives an example of a sandhi rule for ancient Greek: 'any voiced consonant is unvoiced when an s (or other voiceless consonant) follows it'; this rule is realised in, for example, the forms *aigos* (genitive) – *aiks* (nominative) (1974: 102). Lass (1984: 69) locates the principal domain of sandhi as the interface between phonology and syntax; it is concerned with processes at the margins of words in syntactic configurations or at the margins of morphemes in syntactically motivated contexts. Sandhi rules form an important part of morphophonemic description. Andersen (1986) contains accounts of sandhi phenomena in European languages.

Morphology: schools and trends

Three general approaches may be discerned within structuralist morphology, known as word and paradigm, item and process, and item and arrangement.

Word and paradigm

This is the approach to morphology many will be familiar with from schoolbook descriptions of Latin grammar and the grammar of some modern European languages. Word and paradigm (WP) has a long-established history, going back to ancient classical grammars. In this approach, the word is central, and is the fundamental unit in grammar. WP retains a basic distinction between morphology and syntax: morphology is concerned with the formation of words and syntax with the structure of sentences. Central, therefore, to WP is the establishment of the word as an independent, stable unit. Robins (1959) offers convincing criteria for words and argues that WP is an extremely useful model in the description of languages. Word forms sharing a common root or base are grouped into one or more paradigms (e.g., the conjugations of the different tenses of the Latin verb *amo*). Paradigm categories include such things as number in English, or case in Latin, or gender in French. Paradigms are primarily used for inflectional morphemes; derivational ones can be set out in this way but they tend to be less regular and symmetrical.

WP is particularly useful in describing fusional features in languages; using the word as the central unit avoids the problems of 'locating' individual morphosyntactic categories in particular morphs, especially where several may be simultaneously fused in one word-element (e.g., Latin *amabis*, where tense, mood, voice, number, and person cannot be separated sequentially). Matthews (1974: 226) points out that exponents of morphosyntactic categories may extend throughout a word form, overlapping each other where necessary. He also illustrates, with reference to Spanish verbs, how identical forms appear in different paradigms and can only be meaningfully understood in relation to the other members of their paradigm. Thus the systematic reversal of inflectional endings to indicate mood in *-ar* and *-er* verbs in Spanish, e.g., *compra* (indicative), *compre* (subjunctive), compared with *come* (indicative) – *coma* (subjunctive) can only be captured fully within the paradigm (Matthews 1974: 137ff.; see also Booij 2005).

WP avoids the morphophonological problems that beset other approaches and can also dispense with the zero morph, since morphosyntactic features are exhibited in the word form as a whole. In general, WP may be seen to be a model which has great usefulness in linguistic description, particularly for certain types of language.

Item and process

The item and process (IP) model, as its name suggests, relates items to one another by reference to morphological processes. Thus *took* is related to *take* by a process of vowel change. IP considers the morpheme, not the word, to be the basic unit of grammar, and, therefore, the morphology/syntax division is negated. In IP, each morpheme has an underlying form, to which processes are applied. This underlying form will sometimes be the most widely distributed allomorph; thus in Latin *rex*, *regis*, *regi*, *regem*, etc., [ks] occurs only in nominative singular, suggesting *reg-* as the underlying form (Lass 1984: 64; see also Allerton 1979: 223).

In IP, labels such as 'plural' become an operation rather than a form. Processes include affixation, alternation of consonants and/or vowels (e.g., *sing/sang*), reduplication (e.g., Malay plurals: *guru-guru* 'teachers'), compounding, and

stress differences (e.g., *récord/recórd*) (Robins 1959). Matthews (1974: 226) exemplifies how generative grammarians have included processes in descriptions of lexical entries, to activate features such as vowel change when certain morphemes are present (e.g., English *goose* + plural *geese*). IP, like WP, has great value as a model of analysis; it can do much to explain word forms but, as with WP, it cannot account for all features of all languages.

Item and arrangement

Hockett (1954) contrasts IP and IA (item and arrangement) sharply, and Robins (1959) suggests that WP should be considered as something separate, not opposed to IP and IA in the way that IP and IA are opposed to one another. IA sees the word as a linear sequence of morphs which can be segmented. Thus a sentence such as *the wheel/s turn/ed rapid/ly* would be straightforwardly segmented as shown. Again, the morpheme is the fundamental unit. IA talks simply of items and 'the arrangements in which they occur relative to each other in utterances – appending statements to cover phonemic shapes which appear in any occurrent combination' (Hockett 1954).

IA is associated with structural formalism and the systematisation that followed from Bloomfield. In his comparison of IA and IP, Hockett illustrates the contrast in the two approaches to linguistic forms: for IP, forms are either **simple** or **derived**; a **simple form** is a root, a **derived form** is an 'underlying form to which a process has been applied'. In IA, a form is either **simple** or **composite**; a **simple form** is a morpheme and a **composite form** 'consists of two or more immediate constituents standing in a construction'. IA encountered many problems in description, not least how to handle alternation, but its value lay in its rigorous, synchronic approach to unknown languages and its formalism. Its goal was to describe the totality of attested and possible sequences of the language using discrete minimal units established by distributional criteria (Spencer 1991).

WP, IP, and IA have different domains of usefulness and no one model can serve all purposes. All three leave certain areas unresolved, and the best features of each are undoubtedly essential in any full description of a language.

Morphology and generative grammar

The place of morphology within a generative framework has been the subject of much debate since the late 1950s. Early transformational grammarians continued the structuralist tradition of blurring the morphology/syntax division. Chomsky (1957: 32) viewed syntax as the grammatical sequences of morphemes of a language. In general, morphology was not held to be a separate field of study (see Aronoff 1976: 4; Scalise 1984: ix). Phonology and syntax were the central components of grammatical description. Lees (1960) is a key document of the approach that attempts to explain word-formation processes in terms of syntactic transformations. A compound such as *manservant* was seen to incorporate the sentence *The servant is a man;* this sentence by transformation generates the compound (Lees 1960: 119). Such a description is naturally highly problematic, especially when confronted with the idiosyncrasies of derived and compound words.

Chomsky (1970) saw an opposition between this **transformationalist view** and the **lexicalist view**, which transferred to the lexicon proper the rules of derivation and compounding. In the **lexicalist view**, the rules of word formation are rules for generating words which may be stored in the dictionary. Halle (1973) sees the dictionary as a set of morphemes plus a set of word-formation mechanisms; word formation occurs entirely within the lexicon. The growing importance of the lexicon and the debate on the status of word formation meant the steady re-emergence of morphology as a separate area of study.

In the mid-1970s interest grew in natural morphology and in lexical phonology and morphology, lexical phonology for short. **Natural morphology** is an approach which looks for natural universals over a wide range of languages with regard to **morphotactic** (the way morphemes are joined) and morphosyntactic tendencies. The trend is summarised by Dressler (1986). **Lexical phonology** regards the lexicon as the central component of grammar, which contains rules of word-formation and phonology as well as the idiosyncratic properties of words and morphemes. The word-formation rules of the morphology are paired with phonological

rules at various levels or **strata**, and the output of each set of word formation rules is submitted to the phonological rules on the same stratum to produce a word. The lexicon is therefore the output of the morphological and phonological rules of the different strata put together (Kiparsky 1982; see further Pulleyblank 1986; Katamba 1989: Chapter 12). Kiparsky also introduced the **Elsewhere Condition**, which states how rules apply. Rules A and B in the same component apply disjunctively to a form, provided that '(i) the structural description of A (the special rule) properly includes the structural description of B (the general rule); (ii) the result of applying A to Ø is distinct from the result of applying B to Ø. In that case, A is applied first, and, if it takes effect, then B is not applied' (Kiparsky 1982: 136ff). The Elsewhere Condition, thus, ensures that the more specific rule will be applied first.

Anderson's (1982, 1986, 1988, 1992) **Extended Word and Paradigm model** takes the WP approach as starting point. Paradigms have an important place in this system. They are generated by morpholexical rules that specify how morphosyntactic categories are spelled out in phonological form. Anderson gives up the notion of morpheme in inflectional morphology in favour of binary morphosyntactic features, such as [+me] and [-me]. [+me] characterises a first person form and [+you] a second person form, while third person is specified as [-me], [-you]. Morpholexical rules take the feature specification and provide the actual surface form. Stems are provided by the lexicon, by other morpholexical rules or by the output of phonological rules applying to an earlier stage in the derivation (Spencer 1991: 216). Rules are disjunctively ordered and presuppose Kiparsky's Elsewhere Condition, so that when more than one rule could be applied, it is the more specific that wins out. This makes it unnecessary to specify independently how rules are ordered.

In Anderson's system morphemes are processes or rules and in this it differs from approaches such as Selkirk, Williams or Lieber which view morphemes as stored in the lexicon and related by rules.

Williams (1981) attempts to break down the inflection/derivation distinction with regard to word formation as does Selkirk (1982), who clearly places derivation, compounding and inflection within a morphological component of the grammar (but see also Anderson 1982).

For Lieber (1980), as for Williams (1981), morphology is basically a property of the lexicon, a lexical approach that excludes word formation by syntactic means. In Lieber's approach morphemes are listed in the lexicon with information on their syntactic category. In the case of affixes a sub-categorisation frame indicates which category they should be attached to. Sub-categorisation frames are strictly local: morphemes can only relate to sisters (the Adjacency condition, Siegel 1977). The plural affix *-z*, for example, has the following sub-categorisation frame:

z: [[N] _]; [N; +plural]

Inflectional and derivational affixes are treated in the same way. According to Lieber there are no purely morphological differences between both types of affixes. Stems hosting the affixes do not distinguish between them. Spencer (1991: 204) illustrates this with the irregular plural stem allomorph of English 'house', /hauz/, which is also the verb stem allomorph 'to house'.

Another lexicalist approach to morphology is Di Sciullo and Williams's (1987). These authors see syntax and morphology as entirely separate domains, so that syntactic rules cannot influence morphological processes. Important for their approach is the distinction among several ways of understanding the notion of 'word'. Di Sciullo and Williams (1987) distinguish 'word' as a morphological object, as a syntactic atom and 'listemes'. Linguistic objects which do not have the form or the meaning 'specified by the recursive definitions of the objects of the language' (Di Sciullo and Williams 1987: 3) have to be memorised by the speakers and listed in the lexicon; they are called **listemes**. Morphemes form **morphological objects** by the processes of affixation and compounding (Di Sciullo and Williams 1987: 46): 'the words of a language are the morphological objects of a language. **Syntactic atoms** are the syntactic units of the language and because of their atomicity syntactic rules cannot analyse their subcomponents'.

Lexicalist approaches like those mentioned above contrast strongly with approaches which observe the morphology-syntax interface from a syntactical standpoint (Baker 1988; Halle and

Marantz 1993, among others). An example of such an approach is Baker's **incorporation theory**, a radically syntactic approach to morphology. In this approach most aspects of morphology are seen as consequences of syntactic operations (a characteristic Baker shares with Marantz). Baker regards valency changing operations as cases of incorporation of lexical categories into a lexical head via syntactic movement, an idea he applies to different phenomena such as causatives, applicatives, anti-passives and passives. The host element is in most cases the lexical verb; the incorporated element heads its own lexical projection. In Baker's perspective productive morphological processes mirror syntax and in this spirit he formulates the Mirror Principle, which claims that the order of morphological operations as seen in the order of affixes mirrors the order of syntactical operations. In Halle and Marantz' (1993) **Distributed Morphology** the syntactic component manipulates abstract morphemes void of phonological information. Words and parts of words (e.g., affixes) which best fit into the already established sentence structure can be inserted (a 'late insertion' model). In other words, elements of the lexicon are distributed across other components.

Gradience in morphology

While all the approaches mentioned above posit categorical distinctions in morphological structure, a focus on gradience has been evident since the 1990s. Gradience can show in productivity, in regularity or in the frequency of different base forms and words. **Affix ordering** can be used as an illustration. The phenomenon has been dealt with by level-ordered accounts (see Kiparsky 1982 and Booij 2001 for a review).

Optimality Theory (McCarthy and Prince 1993; Prince and Smolensky 1993) offers a way of accounting for morpheme ordering based on the idea of violable constraints and the way they are ranked. It takes into account the interfaces between morphology and phonology as well as between morphology and syntax. The theory includes two basic claims:

1. Universal Grammar is a set of violable constraints.
2. Language-specific grammars rank these constraints in language-specific ways.

Constraints define what is universal, while constraint violations characterise markedness and variation. Two formal mechanisms, GEN and EVAL, regulate the relation between input and output. **GEN** (for **generator**) creates linguistic objects, **EVAL** (**evaluator**) checks the language-specific ranking of **constraints** (called **CON**) and selects the best candidate for a given input out of those produced by **GEN** (Russell 1997) [*see* further OPTIMALITY THEORY].

Probabilistic models focus on the relative frequency of affixes in order to account for their ordering. Relevant are not only the frequency of the affix itself, but also the place it occupies in a paradigm and the support it receives from the paradigm. According to Hay and Baayen (2005: 345) there are different degrees of 'fusion' between affixes and their hosts and this gradience is reflected in the constraints governing affix ordering. See also Baayen (2003) for an overview.

In **connectionist approaches** (Rumelhart and McClelland 1986 and subsequent work) processing is modelled by artificial neural networks which treat morphology as probabilistic. A well-known example is that of the English past tense. The network can be trained to 'learn' past-tense forms on the basis of the present tense by means of weighted input, without using symbolic rules. This input leaves traces which lead to the past-tense forms.

The overview presented here is not an exhaustive account of approaches to morphology, and it has been necessary to leave out of consideration a number of interesting and valuable models. The reader is referred to Spencer and Zwicky (2001) and Booij (2005) for further reading.

T. P. and M. J. M.

Suggestions for further reading

Aronoff, M. and Fudeman, K. (2005) *What is Morphology?* Oxford: Blackwell.
Booij, G.E. (2005) *The Grammar of Words*, Oxford: Blackwell.
Spencer, A. (1991) *Morphological Theory: An Introduction to Word Structure in Generative Grammar*, Oxford: Blackwell.
Štekauer, P. and Lieber, R. (eds) (2005) *Handbook of Word Formation*, Dordrecht: Springer.

N

Non-transformational grammar

The class of non-transformational generative grammars comprises frameworks that share many of the broad goals espoused in early transformational work (e.g., Chomsky 1957) but use different devices to pursue these goals. This class of grammars can be divided into three principal subclasses. The family of **feature-based** approaches, also known variously as 'unification-based', 'constraint-based' or 'description-based' grammars, makes essential use of complex-valued features in the analysis of local and non-local dependencies. **Generalised phrase-structure grammar**, **head-driven phrase structure grammar** and **lexical functional grammar** are among the most important members of this class. There are two basic varieties of **relational** approaches – **relational grammar** and **arc pair grammar** – which both accord primacy to grammatical relations and relation-changing rules. The class of **categorial** approaches uses flexible category analyses and highly schematic rules to combine expressions that often do not correspond to syntactic constituents in other approaches. Categorial approaches fall into three main groups: versions of the **Lambek calculus**, **combinatory categorial grammars** and offshoots of **Montague grammar**.

This article identifies the distinctive characteristics that broadly define the three primary subclasses and summarises some significant properties and insights of individual frameworks.

Feature-based grammars

It is customary to divide feature-based grammars into 'tools' and 'theories'. The class of tools includes versions of the **PATR** formalism (Shieber 1986), along with approaches, such as **functional unification grammar** (Kay 1979), which have mainly provided a basis for **grammar implementations**. While theories such as **generalised phrase-structure grammar** (**GPSG**), **head-driven phrase-structure grammar** (**HPSG**) and **lexical-functional grammar** (**LFG**) have also been successfully implemented, these formalisms provide a more general framework for theoretical analysis.

A distinguishing property of this class of formalisms is the use of complex feature values to regulate grammatical dependencies that are attributed to constituent structure displacements in transformational accounts. The analysis of **subject–verb agreement** provides a useful illustration. The subject agreement demands of an English verb such as *walks* may be expressed by assigning *walks* a complex-valued SUBJ(ECT) feature which contains the features that represent third person and singular number. In a simple feature system, these might be [PERS 3RD] and [NUM SG].

Agreement between the 3sg verb *walks* and the 3sg subject *he* in Figure 1 is then keyed to a non-directional requirement that the SUBJ features associated with the verb must be 'compatible' with the grammatical features of its syntactic subject. The execution details of this analysis vary slightly across approaches, though in all accounts the conditions that determine subject–verb agreement refer to the features introduced by the subject and verb, not to the elements *walks* and *he*. It is the ability to refer to such features, independently of the expressions on which they are introduced, that permits feature-based

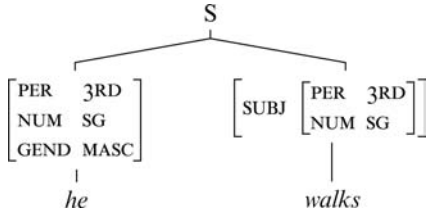


Figure 1 Subject–verb agreement.

approaches to dispense with the constituent-structure displacements that induce the 'flow' of feature information in transformational accounts.

Grammatical compatibility is usually determined 'destructively' in feature-based approaches. What this means in the present case is that the SUBJ features of the verb phrase are directly amalgamated or **unified** with the features of the syntactic subject. The result of combining two sets of compatible features is a single feature structure that contains the information from both. Unifying the features of *he* with the SUBJ features of *walks* yields a structure that just preserves the features of *he*, because these features already contain the SUBJ features of *walks*. If the input features are incompatible, unification is said to 'fail', in virtue of the fact that no consistent structure can contain conflicting values for a single feature 'path'. (The possibility of failure distinguishes unification from the formally similar set union operation.) The central role of unification in GPSG, LFG and HPSG underlies the now largely deprecated term 'unification-based grammars'.

Feature structure unification or, equivalently, structure sharing, retains a key role in most feature-based frameworks. It is nevertheless important to realise that the 'constructive' strategy of determining compatibility by actually combining the features of input structures does not in any way require a fully 'destructive' mechanism that overwrites the inputs in the process. To regulate agreement in Figure 1, we must combine the SUBJ features of *walks* and the features of its syntactic subject. It is, of course, more efficient to merge the original inputs than it is to copy their feature information and amalgamate it in another location, e.g., on the common S mother in Figure 1. Yet there is evidence that this efficiency incurs a significant descriptive cost in coordinate structures and other environments in which a single element is subject to multiple compatibility demands. The fact that such elements may satisfy incompatible demands suggests that, in at least some cases, valence and concord demands must be regulated by the non-destructive or semi-destructive mechanism suggested in recent accounts (Dalrymple and Kaplan 2000; Blevins forthcoming).

Another general issue concerns the symmetrical or non-directional character of operations such as unification. This is widely viewed as a virtue, as order-independent formalisms fit particularly well with incremental models of comprehension or production. Nevertheless, it remains to be seen whether symmetrical operations can provide illuminating analyses of all of the cases that motivate the traditional distinction between agreement 'controllers' and 'targets' (Corbett 1991).

Generalised phrase-structure grammar

Although the descriptive potential of complex syntactic features is set out clearly by Harman (1963), this potential was not fully realised until the emergence of GPSG nearly twenty years later. A decisive step in the development of GPSG – and non-transformational approaches generally – was the demonstration in Gazdar (1981) that any non-local dependency that could be described in terms of transformational 'movement' rules could also be described by a local mechanism that 'passes' the features of a dislocated element successively from daughters to mothers in a phrase-structure tree. This demonstration effectively refuted long-standing claims that transformational devices were necessary for the description of non-local dependencies. The intervening decades have seen the development of a range of other non-transformational strategies (see, e.g., the discussion of **domain union**, **functional uncertainty** and **function composition** below), as well as a general recognition that derivational structure is not an intrinsic property of natural languages or of the language faculty, but rather a purely contingent property of transformational approaches.

Yet, with the benefit of hindsight, the success of the GPSG analysis of unbounded dependencies can be seen as something of a blessing and a curse. On the positive side, the discovery that

phrase-structure grammars could define structural descriptions isomorphic to those attributed to transformational devices threw open a number of issues that many linguists had taken to be settled. On the negative side, the successful use of features to mimic the effects of 'movement' rules encouraged two somewhat conservative tendencies in later GPSG work. The first was a tendency to push feature-based strategies into areas where they did not provide an illuminating analysis. The second was a tendency to use features to 'emulate' existing transformational analyses.

GPSG treatments of co-ordination display the first tendency, while analyses of passivisation illustrate the second. GPSG accounts of co-ordinate structures squarely address the problems posed by cases of unlike constituent co-ordination, such as *Max is a Guardian reader and passionate about penal reform*. In this example, the noun phrase *a Guardian reader* appears to be conjoined with the adjective phrase *passionate about penal reform*, violating the widely assumed constraint that conjuncts must be of the same category. The solution developed within GPSG assigns a coordinate mother the **generalisation** of the features of its conjunct daughters, so that *a Guardian reader and passionate about penal reform* is assigned the features from each conjunct that does not conflict with the other conjunct. GPSG accounts acknowledge that this account does not extend to cases of non-constituent co-ordination, and subsequent work suggests that a generalisation-based account also does not apply correctly to verbs with unlike valence demands. At an even more basic level, one might question the grounds for treating *a Guardian reader and passionate about penal reform* as a constituent in the first place. While the precise analysis of these constructions remains a matter of dispute, it is generally accepted that the solution is not likely to lie in an innovative strategy for combining the features associated with unlike conjuncts or non-constituent sequences.

By pushing a feature-based strategy to its limits, GPSG analyses of coordination can be seen to obtain a useful, if somewhat negative, result. GPSG treatments of passivisation in terms of **meta-rules** are perhaps best regarded in much the same way. These accounts demonstrate that the structure-to-structure mapping invoked in transformational analyses can be mimicked by a meta-rule that maps phrase-structure rules that introduce active VPs onto derived rules that introduce detransitivised passive VPs. Yet, by re-implementing the transformational analysis, GPSG accounts inherit the weaknesses of this analysis, while exposing limitations of a standard phrase-structure formalism. As LFG accounts in particular have shown, passivisation is a lexical – indeed, derivational – process, which is most insightfully expressed by analyses that relate entries, rather than structures or syntactic rules. This type of analysis is unavailable in a standard phrase-structure grammar, which represents the lexicon implicitly in the rules that rewrite preterminals. GPSG extends this conception by introducing entries that are cross-indexed with rules, though these entries still do not carry the information required for a lexicalist analysis of the passive.

GPSG accounts are arguably most successful in cases where they address a traditional issue or present an essentially new approach. For example, the GPSG **head feature convention** (or **principle**) illustrates how complex features yield an insightful treatment of traditional notions like 'endocentricity'. This principle requires that a syntactic head and the phrase that it heads must have the same values for the various 'head' features that represent part of speech and syntactically relevant inflectional properties. The inclusion of inflectional features contrasts with versions of **X-bar theory** in which parts of speech features are, without any explicit justification, singled out as the only head features. In GPSG, the features of a finite clause may be inherited from a finite verb on the assumption that clauses are endocentric verbal projections. In transformational accounts, the distribution of tense features must again involve recourse to a movement rule.

The definitive presentation of GPSG in Gazdar et al. (1985) displays some of the other insights developed in this framework, along with the attendant formal complications. A significant feature of later versions of GPSG is the decomposition of standard **phrase-structure rules** into separate **immediate dominance** (ID) and **linear precedence** (LP) constraints. This division of labour permits an elegant and often highly general description of various types of word order patterns and word order. To take

just one example, the relatively free ordering of a verb and its complements in a language like Russian may be described by introducing no rule that imposes a relative order on these elements. However, the usefulness of the structure/order dissociation is severely constrained by the desire to keep the GPSG formalism within the class of **context-free grammars**. One consequence of this meta-theoretical constraint is that precedence rules must have the same domain as dominance rules and thus may not order non-siblings. This entails that the free ordering of a verb and a VP-external subject in Russian cannot be attributed simply to the lack of an applicable linear constraint. Although **liberation meta-rules** were proposed to telescope a set of rules and define essentially flat constituent structures, the use of these rules undercuts the motivation for the original structure/order division. The descriptive challenge posed by free constituent order languages was not met in a satisfactory way until the advent of **linearisation grammars** in HPSG (see below).

As is generally the case with feature-based approaches, GPSG accounts are explicitly – often painstakingly – formalised. The difficulties that this formalisation may present to contemporary readers reflect a genuine tension between the simple architecture and complex 'control structure' of GPSG. At one level, a GPSG can be viewed as a set of constraints, interpreted uniformly as 'tree licensing conditions'. Dominance rules license tree structure, precedence rules dictate the relative order of siblings, and feature constraints determine the distribution of features on non-terminal nodes. Yet this straightforward conception is complicated in GPSG by the numerous types of feature conditions and their often intricate interactions. A general source of complications is the default interpretation of conditions, such as **feature specification defaults** or, indeed, the **head feature convention**. This aspect of GPSG has not been taken up directly in other syntactic approaches, though defaults appear in a different guise in recent **optimality extensions of LFG**.

Head-driven phrase-structure grammar

HPSG is in certain respects a direct descendant of GPSG. However, it also includes features of Head Grammars (Pollard 1984), along with properties of categorial grammars and systems of feature logic. The two book-length expositions of HPSG, Pollard and Sag (1987, 1994), outline a general sign-based conception that integrates these diverse influences.

HPSG incorporates a number of evident improvements over GPSG. Foremost among these is a 'description-based' perspective that clarifies some of the representational issues that remained unresolved in GPSG. Like LFG, HPSG proceeds from a fundamental distinction between **(feature structure) descriptions**, which are sets of grammatical constraints, and the **feature structures** that actually model the expressions of a language. This distinction is clearly illustrated by the treatment of lexical entries, which are not viewed as structures, but rather as descriptions of lexical structures. Descriptions in HPSG are represented as standard **attribute-value matrices** (AVMs), similar to the bracketed 'feature bundles' familiar from phonological analyses. Structures are rarely exhibited in HPSG accounts, though they are conventionally depicted as directed acyclic graphs. The correspondence between descriptions and the structures that they describe is defined in terms of a standard satisfaction relation, as in **model-theoretic semantic** approaches. The structures that satisfy a description must, at the very least, preserve all of the information in the description, and also identify all of the values that are specified as token-identical in the description.

The interpretation of the basic HPSG formalism is thus relatively straightforward, as is the interpretation of feature distribution constraints. A distinctive aspect of HPSG is the assumption that structures are **typed**, and that types may be organised into general **type hierarchies**, in which properties may be inherited from general types to their subtypes. For example, the general type *sign* contains the subtypes *word* and *phrase*. Features common to all signs, i.e. the fact that they are associated with a phonological form, are associated with the type *sign* and inherited down to its subtypes. The properties that distinguish words from phrases are in turn associated with the corresponding subtypes. A general strategy of type-based inheritance achieves considerable concision, while eliminating some of

the vagaries of the heterogeneous feature distribution conditions in GPSG. To take a simple example, the open-class categories 'noun', 'verb' and 'adjective' are represented by the *head* subtypes *noun*, *verb* and *adjective*. Properties that are only distinctive for a particular part of speech may be associated with the appropriate subtype. The features that represent tense/aspect properties or distinguish infinitives from participles are associated with the *verb* type and thereby restricted to verbs and their projections. Declensional features like case may likewise be associated with nouns and/or adjectives. Current models of HPSG extend the use of type inheritance to classes of construction types (Sag 1997). The **feature declarations** that are directly associated with a given type or inherited from a more general type then represent the features for which that type may – and in current versions of HPSG must – be specified.

Moreover, it is possible to introduce a qualified notion of 'default' within this kind of type hierarchy. HPSG-type hierarchies make use of multiple inheritance, meaning that a given type may inherit properties from different general types. This permits a maximally general cross-classification and avoids the need to introduce the same properties at different points in a hierarchy. However, multiple inheritance also raises an issue of consistency, since different general types may introduce conflicting properties. Multiple inheritance systems usually address this issue by assigning a relative priority to general types, so that one type may 'outrank' or 'take precedence over' another type. In cases of conflict, the inheritance of properties from a higher-ranking type may then pre-empt the inheritance from a lower-ranking type. Controlling the inheritance of properties in this way provides an 'offline' default mechanism that expresses a limited notion of defeasibility, while retaining a standard non-default interpretation of the constraints themselves.

In addition to these largely technical improvements, the neo-Saussurean perspective adopted in HPSG permits a highly flexible treatment of the relation between form and features. The form associated with a *sign* is represented as the value of a PHON(OLOGY) attribute, rather than by a terminal or sequence of terminals, as in other approaches. This difference is illustrated by the descriptions of the noun *book* in Figure 2 (the SUBCAT(EGORISATION) feature is described below).

While these alternatives may look rather like notational variants, the description in Figure 2(a) implicitly supports the feature–form mapping characteristic of word and paradigm (WP) models of morphology (Anderson 1992; Stump 2001). At the lexical level, a sign-based system provides the formal prerequisites for morphological analyses in which a given form is said to 'spell out' or 'realise' a particular feature combination. Further, as Ackerman and Webelhuth (1998) argue at some length, this **exponence-based** conception extends straightforwardly to a range of periphrastic constructions in which multiple words may realise a notion like 'perfect' or 'passive'.

At the level of phrasal analysis, the introduction of a *marker* type reconstructs the distinction that Hockett (1958) draws between the **immediate constituents** (ICs) of a construction, and formatives that merely serve to identify or 'mark' the construction. There is a direct parallel between the WP treatment of *-s* in *books* as a marker of plurality, rather than a morphological constituent proper, and the HPSG treatment of complementisers and coordinating conjunctions as markers of subordination and coordination, respectively, rather than defective 'functional' heads. The HPSG formalism likewise permits, in principle, a description of non-biunique patterns of exponence. To turn to a construction discussed by Hockett 1958, iterative coordinate structures, in which a coordinating conjunction is repeated before or after each conjunct, may be treated as a case of 'extended exponence' (Matthews 1974/1991) where the distinct occurrences

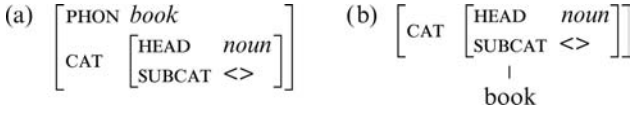


Figure 2 Lexical signs in HPSG.

of the conjunction collectively 'spell out' or 'realise' the features that represent the notion 'coordinate category'.

In sum, the simple representational shift illustrated in Figure 2 avoids a commitment to the rigid 'item and arrangement' perspective that many generative approaches have uncritically inherited from their structuralist predecessors. The basic design of HPSG also frees analyses from other, similarly anachronistic, assumptions.

Linearisation-based accounts of word order variation provide perhaps the most striking illustration. The form associated with a node in a phrase-structure tree is standardly defined as the concatenation of the terminals dominated by that node. Thus the tree in Figure 3(a) represents the sentence *He should walk*. On the conventional assumption that sister nodes are strictly ordered, it is not possible to interleave constituents that occur at different levels. In particular, there is no way to assign the subject–predicate structure in Figure 3(a) to the corresponding question *Should he walk?*

This is precisely the sort of word order alternation that American structuralists took to justify discontinuous IC analyses and which motivated non-concatenative 'wrap' operations in Head Grammars and Montague Grammar. Linearisation-based models of HPSG (Reape 1993; Kathol 2000) develop a general approach to this phenomenon in terms of independent **word order domains**. In the default case, the DOM(AIN) of a phrase is just a list containing its daughters, so that the form or 'yield' of the phrase is defined in much the same way as for a phrase-structure tree. However, by allowing daughters to pass up their DOM values to their mother, linearisation grammars also make it possible to interleave or 'shuffle' non-siblings. The intuition underlying these approaches can be illustrated with reference to Figure 3(b). To simplify this illustration, DOM values are assumed to be lists of signs, as in Reape (1993). The boxed integer 'tags' in Figure 3(b) represent token identity and indicate that the DOM value of the VP contains its actual V and NP daughters. Precedence constraints apply to DOM elements, determining a sequence whose order defines the relative order of PHON elements.

The yield of the S in Figure 3(b) thus depends on how its DOM list is defined. If this list contains the daughters of S, [1] and [4], it will only be possible to concatenate *he*, the yield of the subject daughter, to the yield of the predicate, i.e. the entire string *should walk*. However, if the VP in Figure 3(b) instead passes up its own DOM value, the DOM value of the S will contain the elements [1], [2] and [3]. This expanded domain '**unions**' the subject into the domain of the predicate. Precedence constraints that place the head initially in this domain will determine the list ([2], [1], [3]). Concatenating the yields of these elements produces the 'inverted' order *should he walk*.

The dissociation of structure and order illustrated in Figure 3(b) likewise accommodates the free ordering of a subject and VP-internal object in Russian, which was identified above as a problem that defied analysis in GPSG. While these cases are both extremely local, linearisation approaches provide a general mechanism for describing constituency-neutral ordering variation. Reape (1993) and Kathol (2000) present analyses of the ordering freedom characteristic of the *Mittelfeld* in German, while recent extensions extend a linearisation approach to cases of scrambling (Donohue and Sag 1999) and extraction (Penn 1999). Linearisation accounts thus permit a simple and uniform

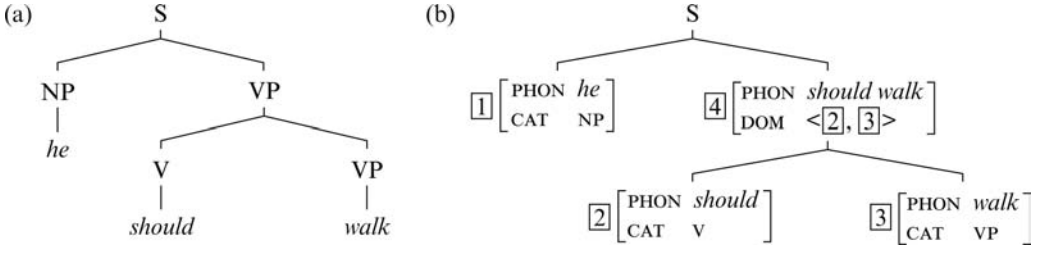


Figure 3 Linearisation of order domains.

treatment of hierarchical structure within HPSG, avoiding the spurious structural variation characteristic of transformational and some categorial approaches. Yet the introduction of word order domains also potentially undermines the feature-based technology for handling word order variation, including the feature-based account of unbounded dependencies.

An aspect of HPSG that reflects the influence of categorial approaches is the treatment of valence. The initial version of HPSG in Pollard and Sag (1987) introduced a single SUBCAT feature that consolidated all of the subcategorised arguments of a head. Pollard and Sag (1994) subsequently distinguished separate SUBJ(ECT) and COMP(LEMENT)S lists, while retaining an argument structure list, ARG-S, as a lexical counterpart of the SUBCAT list. Some current versions of HPSG add a further DEP(ENDENT)S list to integrate grammatical dependants that are neither subjects nor complements.

A significant difference between argument structure and valence features is that the elements of SUBJ and COMPS lists are removed or 'cancelled' as syntactic arguments are encountered. Thus the transitive verb *hit* begins with the singleton SUBJ list and singleton COMPS lists in Figure 4, which each contain an element from the ARG-S list. The VP *hit Max* retains a singleton SUBJ list, but has an empty COMPS list, signifying that it does not select any further complements. The S *Felix hit Max* has both an empty SUBJ and COMPS list, signalling that it is fully 'saturated'.

The tags on the syntactic subject and object in Figure 4 indicate that the features of these arguments are shared or, in effect, unified with the corresponding valence elements.

The flow of feature information represented in Figure 4 highlights the strongly 'head-driven' nature of some versions of HPSG. The head in Figure 4 functions as the ultimate repository of the grammatical information in this sentence, since the features of the verb and its arguments are consolidated in the ARG-S value. In contrast, the projections of the verb become progressively less informative as elements are popped off their valence lists. The 'head-directed' flow in Figure 4 thus represents the transitivity of a head, while tightly restricting access to information about 'cancelled' arguments.

In addition to the properties discussed above, HPSG signs also represent constituent structure in terms of DAUGHTERS attributes. It is nevertheless common for HPSG analyses to be expressed informally as annotated tree structures, as in Figure 3(b) and Figure 4. Semantic and pragmatic information is also expressed via CONTENT and CONTEXT attributes. Yet the empirical consequences of bundling this disparate information together in a single data structure are not always obvious. The non-syntactic properties in signs rarely show significant interactions with grammatical processes, such as sub-categorisation. Agreement features, which HPSG accounts introduce as part of the CONTENT, are an exception, though these features are more traditionally regarded as syntactic.

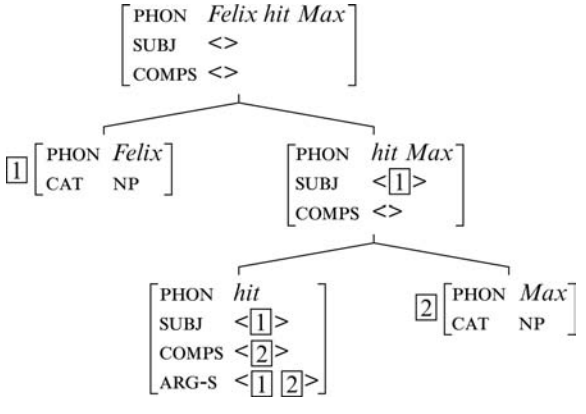


Figure 4 Valence and argument structure in HPSG.

Lexical-functional grammar

In some regards, LFG straddles the classes of feature-based and relational approaches. On the one hand, the lexicalist and description-based framework outlined in Kaplan and Bresnan (1982) is close to the perspective subsequently adopted in HPSG, though there is also a number of significant respects in which these approaches diverge. At the same time, the analyses developed in Bresnan (1982a) and subsequent work show an affinity with relational accounts, both in the importance they attach to grammatical functions and in their comparatively broad typological coverage.

LFG exhibits a clean formal architecture, with well-defined interfaces between levels of representation. A unique aspect of LFG is the separation between **c(onstituent)structures**, which represent category and ordering information, and **f(unctional) structures**, which represent the features that represent valence properties and feed semantic interpretation. The c-structure in Figure 5(a) and the f-structure in Figure 5 (b) express the analysis assigned to *Felix hit Max*.

The functional annotations in Figure 5(a) define the correspondence between c-structure nodes and their f-structure counterparts in Figure 5(b). The equation '↑ = ↓' expresses the LFG counterpart of the **head feature principle** by associating the V, VP and S nodes with the same f-structure in Figure 5(b). This shared f-structure is the complete or 'outermost' f-structure in Figure 5(b). The equations 'SUBJ' and 'OBJ' unify the properties of the syntactic subject and object in Figure 5(a) into the values of the SUBJ and OBJ attributes in Figure 5(b).

The structures in Figure 5 are defined by annotated phrase-structure rules in conjunction with the lexical entries for the items *Felix*, *hit* and *Max*. The rules in Figure 6(a) determine the tree in Figure 6(a). The entry in Figure 6(b) likewise represents the properties of the verb *hit*.

The category symbol 'V' specifies the preterminal mother of *hit* in Figure 5(a). The functional equations in Figure 6(b) are both satisfied by the f-structure in Figure 5(b). The TENSE feature specified in Figure 6(b) is obviously present in Figure 5(b), as is the PRED value. The LFG **completeness** and **coherence** conditions, which are keyed to PRED features, are also satisfied in Figure 5(b). Informally, an f-structure is **complete** if it contains all of the grammatical functions governed by its predicate and **coherent** if all of its governable grammatical functions are governed by its predicate. Governable functions are essentially those that can be selected by a predicate. The functions governed by the predicate 'hit < (SUBJ)(OBJ) >' are just SUBJ and OBJ. Since exactly these functions are present in Figure 5(b), the f-structure is complete and coherent.

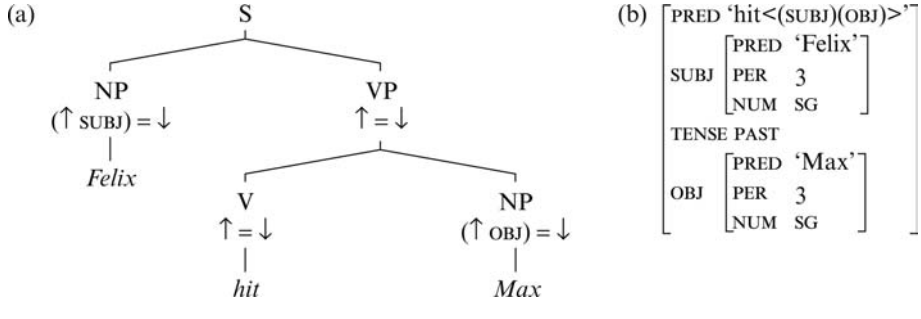


Figure 5 LFG c-structure and f-structure analysis.

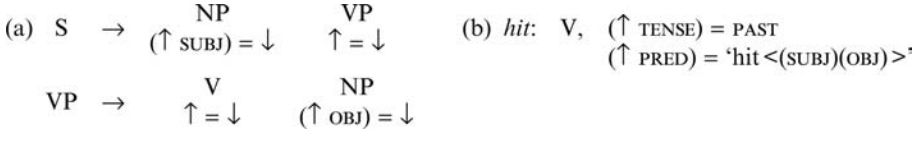


Figure 6 Annotated phrase-structure rules and lexical entry.

The analyses in Figure 5 highlight some important contrasts with GPSG and HPSG. One unfortunate notational difference concerns the interpretation of AVMs. HPSG accounts use AVMs as a convenient graphical representation of descriptions, i.e. as sets of constraints. LFG interprets AVMs like Figure 5(b) as structures that provide the solution to a set of constraints.

The role of annotated phrase-structure rules in LFG reflects a more substantive difference. The separation of order and structure in GPSG and HPSG reflects an interest in unbundling the different types of information expressed by phrase-structure rules. The addition of functional annotations moves in precisely the opposite direction, by incorporating a further sort of information into phrase-structure rules. The use of an augmented phrase-structure formalism has a number of formal advantages, though it also severely constrains the role of constituency relations. Thus in interleaved constructions, such as Germanic cross-serial dependencies, a verb and its complements cannot form a syntactic constituent. Instead, these elements are introduced on parallel c-structure 'spines' and only associated in the corresponding f-structure. The c-structures proposed for cross-serial dependencies in Bresnan et al. (1982) exhibit other remarkable properties, including verb phrases that consist entirely of noun and prepositional phrases. The patently expedient nature of these c-structures clearly signals the diminished importance of constituent structure in LFG.

Indeed, LFG c-structures are in many respects closer to the derivational structures of a categorial grammar than to the part–whole structures represented by **IC analyses**. Much as derivational structures are essentially by-products, produced in the course of deriving semantic representations, c-structures are the by-product of deriving f-structures in LFG. In versions of LFG that introduce a notion of **functional precedence** (Bresnan 1995; Kaplan and Zaenen 1995), c-structures do not even retain their original role as the unique locus of ordering relations and constraints.

The centrality of grammatical functions is another distinctive property of LFG, one which has contributed to highly influential analyses of relation-changing rules. Beginning with the analysis of the passive in Bresnan (1982b), LFG accounts have succeeded not only in establishing the viability of lexicalist analyses, but often in showing the essential correctness of such analyses. The influence of these analyses is perhaps most obvious in the treatment of passivisation and other lexical rules in HPSG (Pollard and Sag 1987). The structure-neutral analyses proposed in relational approaches likewise strongly suggest a lexical reinterpretation. Moreover, the ultimately lexical basis of relation-changing rules is also tacitly conceded in transformational accounts that invoke a morphological operation to detransitivise a verb by 'absorbing' its case or thematic properties.

While the locus of relation-changing rules has remained constant in LFG, the form of these rules has undergone significant changes. This evolution is reflected in the contrast between the treatments of passive represented in Figures 7–9. Figure 7 summarises the analysis in Bresnan (1982b), while Figure 9 outlines the lexical mapping approach of Bresnan and Kanerva (1989).

The form for *bite* in Figure 7(b) identifies the mapping between argument structure, thematic structure and grammatical functions characteristic of a transitive verb. The rule in Figure 7(a) applies to this lexical form, and defines the derived form in Figure 7(c). The first operation in Figure 7(a) suppresses arg1, which is lexically associated with the agent role, by reassigning arg1 the null grammatical function 'Ø'. This determines a 'short' passive in which the agent is not realised. The second operation in Figure 7(b) 'promotes' arg2 by reassigning it the SUBJ function.

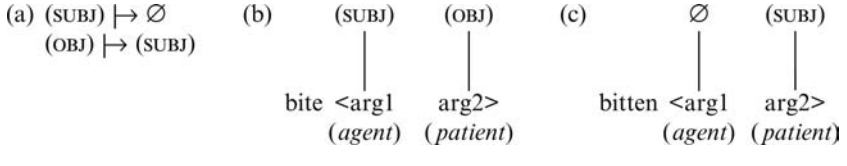


Figure 7 Passivisation by lexical rule.

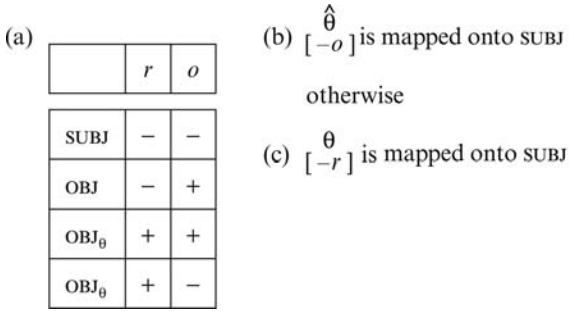


Figure 8 Argument classification and subject mapping principles.

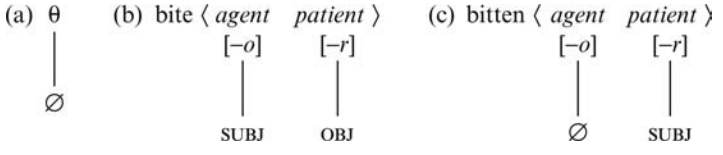


Figure 9 Passive via thematic suppression.

Given the completeness and coherence conditions, the form in Figure 7(c) determines an f-structure whose only governed function is a SUBJ which is associated with the patient role. The alternation between the forms in Figure 7(b) and (c) thus expresses the relation between active sentences such as *Cecilia bit Ross*, and corresponding passives such as *Ross was bitten*. More recent work in LFG has refined this analysis in the context of what is known as **lexical mapping theory** (LMT). The main prerequisites of LMT are set out in Figure 8.

The features [*r(estricted)*] and [*o(bjective)*] cross-classify the governable grammatical functions in Figure 8(a). These features then guide the mapping principles in Figure 8(b) and (c), which link up the subject with a semantic role. The role $\hat{\theta}$ designates the highest thematic role of a predicate, which is usually taken to be defined with reference to a universal thematic hierarchy. The principle in Figure 8(b) associates the highest role with the SUBJ function. If the highest role is not available, the principle in Figure 8(c) maps an unrestricted role on to the SUBJ.

The configuration in Figure 9(a) represents the LMT counterpart of the lexical rule in Figure 9(b). This mapping associates $\hat{\theta}$ to the null function Ø, thereby pre-empting the principles in Figure 8 and determining the contrast between the argument structures in Figure 9. The active structure in Figure 9(b) conforms to the principle in Figure 8(b), as the SUBJ is mapped onto the highest role, the agent role. In the passive structure in Figure 9, the agent is 'suppressed' or unavailable by virtue of its association to Ø. Hence the SUBJ is linked to the unrestricted patient role, in conformance with the mapping principle in Figure 8(c).

The LMT account in Figure 9 differs from the lexical rule analysis in two main respects. First, the LMT analysis uses monotonic (albeit conditionalised) mapping principles, in place of non-monotonic attribute changes. More strikingly, suppression does not refer to subjects, but instead targets the highest thematic role. This shift implicitly rejects the traditional view, developed in greatest detail in relational approaches, that passivisation is restricted to verbs that select subjects.

These assumptions must of course be understood in the context of the larger LMT programme, and its ambitious goal of mapping out the correspondences between grammatical functions and lexical semantics. Nevertheless, one can question whether either of the revisions incorporated in the LMT analysis contributes to an improved treatment of passives. It is, for example, not altogether clear why monotonicity

should be regarded as a desirable property of derivational rules, given that derivational processes are to a great degree defined by their non-monotonic, feature-changing, character. The benefits of a thematic role-based notion of suppression are similarly open to question. The rationale for this change rests on a number of prima facie cases of passives of **unaccusative** predicates (discussed in more detail in connection with relational approaches, below). Since unaccusative predicates, by definition, have no subject to target, a subject-sensitive passive rule cannot apply correctly to these cases. Yet the existing literature hardly considers the alternative, advocated by Postal (1986), that these cases involve impersonal rather than passive constructions, and thus are not directly relevant. Moreover, even a cursory examination of some of the 'passive' constructions in question suggests that they are equally problematic for role-based accounts. For example, the celebrated Lithuanian passive freely applies to 'weather' verbs (Ambrazas 1997), which are not standardly associated either with subjects or with thematic roles.

Contemporary work takes LFG in a number of different directions. One line of research involves incremental, carefully formalised, extensions to the original LFG formalism. Typical of this work is the f-structure treatment of extraction in terms of **functional uncertainty** (Kaplan and Maxwell 1995). In effect, this device identifies a dislocated TOPIC function with an *in situ* grammatical function GF by means of a regular expression of the form '(↑TOPIC) = (↑COMP* GF)'. A separate line of research explores more radical extensions that integrate ideas from **optimality theory** [*see* OPTIMALITY THEORY]. Bresnan (2000) provides a good point of entry into this literature.

Relational grammar

Relational grammar (**RG**) was initially developed in the mid-1970s by David Perlmutter and Paul Postal as a relation-based alternative to the highly configurational transformational accounts of that period. The three volumes of *Studies in Relational Grammar* (Perlmutter 1983; Perlmutter and Rosen 1984; Postal and Joseph 1990) provide a good survey of work in RG until the late 1980s, and display the descriptive detail and typological breadth that is typical of much of the work in this tradition. The insights developed in this framework have been highly influential and have often been directly integrated into other frameworks. The range of phenomena analysed within RG likewise provides a useful empirical 'test suite' for the validation of other approaches.

RG incorporates two distinctive claims. The first is that grammatical relations are primitive constructs that cannot be defined in terms of phrase-structure configurations, morphological cases, thematic roles, or any other properties. RG recognises two classes of grammatical relations. The core relations are referred to as **terms** and designated by integers. Subjects are designated as '1s', direct objects as '2s', and indirect objects as '3s'. Term relations correspond to the elements of an ARG-S list in HPSG or unrestricted functions in LFG. There is also a distinguished non-term relation, the **chômeur** relation, which is assigned to an element that becomes 'unemployed' by the advancement of another. This relation has no direct counterpart in non-relational approaches.

The second basic claim is that grammatical systems are intrinsically multistratal, consisting of multiple syntactic levels at which expressions may be assigned distinct grammatical relations. Strata are subject to a variety of well-formedness conditions, usually stated in the form of 'laws'. Among the important laws are the **Stratal Uniqueness Law**, which allows at most one subject, object and indirect object; the **Final 1 Law**, which requires a subject in the final stratum; and the **Motivated Chômage Law**, which prevents elements from 'spontaneously' becoming chômeurs.

Grammatical descriptions in RG take the form of **relational networks** that represent the relations associated with an expression at different strata. The network associated with *Cecilia bit Ross* in Figure 10(a) illustrates the limiting case in which there is no change in relations. The arc labelled 'P' identifies the verb *bit* as the predicate of the clause. The '1 arc' likewise identifies *Cecilia* as the subject (i.e. the 1) while the '2 arc' similarly identifies *Ross* as the direct object.

Changes within a relational network provide a general format for expressing relation-changing

processes such as passivisation or causativisation. These changes fall into two basic classes: **advancements**, which assign an element a higher-ranking relation, and **demotions**, which assign a lower-ranking relation. For example, passive is analysed as a case of a 2 → 1 advancement, in which an initial object becomes a final subject, thereby forcing the initial subject into chômage. This view of the passive is represented in the analysis of *Ross was bitten by Cecilia* in Figure 10(b).

In the initial stratum at the top of Figure 10(b), *Cecilia* and *Ross* bear the same grammatical relations as in the active clause in Figure 10(a). In the second and final stratum, *Ross* is advanced to subject, represented by the fact that it 'heads' the '1 arc'. Given the Stratal Uniqueness Law, *Cecilia* cannot also remain a 1 and thus must become a chômeur, heading the 'Cho arc'.

The multistratal perspective illustrated in this treatment of the passive also underlies the **unaccusative hypothesis** (UH), which represents one of the lasting contributions of RG. In effect, the UH sub-classifies predicates according to the initial grammatical relation associated with their subjects. Predicates whose final subjects are also initial subjects are termed **unergative**. The transitive verb *bit* in Figure 10(a) is unergative, as are intransitive verbs like *telephone* or *ski*. In contrast, predicates whose final subjects are initial non-subjects are termed **unaccusative**. This class is canonically taken to include intransitives like *exist*, *vanish*, *disappear*, *melt*, *faint*, etc. RG accounts also extend this class to include semi-transitive predicates such as *last* and *weigh*.

The networks in Figure 11 illustrate the advancement of non-subjects in initially unaccusative clauses. In the intransitive structure in Figure 11(a), representing *The manuscript vanished*, *the manuscript* is the direct object in the initial stratum and is advanced to subject in the final stratum. In Figure 11(b), representing *The concert lasted an hour*, *the concert* is analysed as an initial oblique, which heads the oblique GRx arc in the initial stratum. This oblique is advanced to subject in the final stratum, while *an hour* is an object in both strata (Perlmutter and Postal 1984).

A striking property of unaccusative predicates is their resistance to passivisation. Neither *last* nor *weigh* may be passivised in English, and the counterparts of *vanish* or *exist* tend to resist passivisation in languages that may otherwise form passives of intransitive verbs. Perlmutter and Postal took the robustness of this pattern as evidence of a universal constraint on advancement. Their 1-Advancement Exclusiveness Law (1AEX) had the effect of barring multiple advancements to subject in a single clause. Passives of unaccusative would violate the 1AEX, by virtue of the fact that they would involve both unaccusative and passive advancement in a single clause.

As mentioned in connection with the LMT treatment of passive in LFG, the factual basis of the 1AEX has subsequently come under scrutiny. Even if we were to assume that the putative counterexamples are not misanalysed, the observation that unaccusatives resist passivisation describes a highly pervasive pattern. This pattern would seem to call for some principled explanation.

One particular alternative, raised but subsequently rejected in the RG literature, is worth reviewing for the insight it lends to this framework. The naive reader might at first wonder

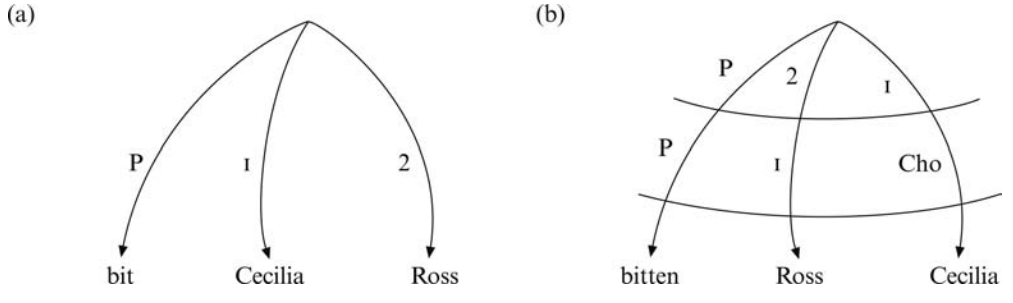


Figure 10 Active and passive relational networks.

why the 1AEX is needed at all in RG. If passivisation demotes initial subjects to chômeurs, and only unergative predicates have initial subjects, surely it follows directly that there can be no passives of unaccusatives? Further, as noted by Comrie (1977), an analysis along these lines applies to personal and impersonal passives, yielding a simple and uniform treatment of passive constructions.

Alas, however, this account runs foul of the Motivated Chômage Law (MCL), since the initial subject of an intransitive must go into chômage 'spontaneously', not as the result of an antecedent advancement to subject. One might have expected this conflict to lead to a reassessment of the MCL, along with other laws, such as the Final 1 Law, which disallows genuinely impersonal (i.e. subjectless) constructions. Instead, Permutter and Postal mounted a spirited and ultimately successful defence of the MCL. The arguments advanced in support of the MCL featured a number of ingenious and innovative strategies, including the advancement of invisible 'dummy' objects to force subjects of unergative intransitives into chômage. However, the defence of the MCL was something of a pyrrhic victory.

The MCL and Final 1 Law were upheld, and with them an intrinsically promotional treatment of the passive. Yet this orthodoxy was maintained at great cost. A general and largely theory-neutral treatment of passives was discarded, at a time when most competing approaches were only beginning to register the existence of impersonal passives. The analyses adopted in RG to preserve the MCL also contributed to the alienation of linguists, such as Comrie, who were sympathetic to the goals of RG, but were more interested in broad-based description and analysis than in the interactions of increasingly theory-internal relational laws.

The treatment of passivisation and unaccusativity in RG illustrates a tendency within this framework to express fundamental, theory-neutral, insights in terms of a highly idiosyncratic and often inscrutable system of formal laws and principles. This tendency reaches its apogee in the closely related Arc Pair Grammar (APG) framework (Johnson and Postal 1980). APG shows more attention to formal detail than RG, facilitating comparisons with other non-transformational approaches. For example, the notion of 'overlapping arcs' proposed in Johnson and Postal (1980) corresponds quite closely to structure sharing in HPSG, and to the identity implicated in functional control in LFG. APG analyses likewise provide a distinctive perspective on issues of broad relevance, as in the case of the impersonal re-analysis of the passive constructions in Postal (1986). Unfortunately, these analyses tend to be formulated in an extremely uncompromising fashion, confronting the reader with an often impenetrable thicket of definitions and examples, illustrated or, at any rate, accompanied by, whimsically labelled and exotically annotated diagrams.

Nevertheless, the range of analyses developed in RG and APG provide a sustained argument for an intrinsically relational and multistratal perspective. This perspective also casts interesting light on the goals and methods of more structurally oriented approaches. For example, the transformational claim that constructions are mere 'epiphenomena' or 'taxonomic artifacts' (Chomsky 1995) makes perfect sense from the standpoint of RG. If the essential properties of constructions are indeed relational, it is only to

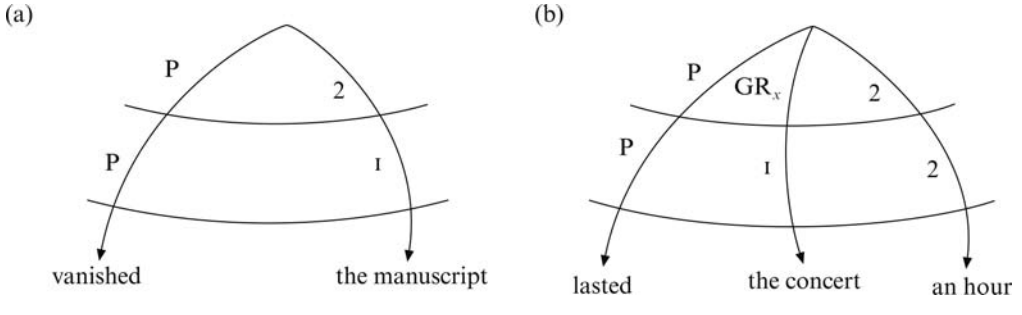


Figure 11 Unaccusative advancement.

be expected that analyses that make almost exclusive reference to features of form and arrangement will never yield a unified account of passive constructions.

Conversely, the lexicalist orientation of other non-transformational approaches suggests a basis for the strikingly non-structural character of RG analyses. Although these analyses are quite explicitly presented as syntactic, they conspicuously suppress all but the most superficial features of form and arrangement. In effect, the properties just suffice to associate the elements in a relational network with expressions in the clause it represents. One might of course regard RG as merely underspecified or incomplete in these regards. However, a more principled explanation can be obtained by reinterpreting RG as a covert theory of lexical alternations, in which grammatical relations are associated with the argument positions specified by a predicate, rather than with the syntactic arguments that ultimately fill those positions. The lack of configurational properties then follows from the fact that such properties are simply not defined in the lexical entries of predicates.

The strata in RG can likewise be associated with the lexical levels or strata assumed by nearly all approaches to morphology. A standard distinction between derivational stems and inflectional words provides morphological counterparts of initial and final strata. Where there is evidence for intermediate strata, these can be imported from approaches that recognise further lexical levels. Multistratalism thus does not require the notion of a syntactic derivation, and the derivational interpretation of RG is perhaps best regarded as a legacy of its transformational origins.

Categorial grammar

Categorial grammars are in some respects the most venerable systems of formal analysis, deriving originally from the proposals of Ajdukiewicz (1935), particularly as these were developed in Bar-Hillel (1953) and Lambek (1961). A central feature of categorial systems is the assignment of expressions to **functor** and **argument** categories, and the use of a general rule of function application to combine functors with their arguments. Ajdukiewicz postulated two basic categories – 'sentence' and 'name'. All functor categories are non-basic, defined ultimately in terms of basic categories. Intransitive verbs or verb phrases are assigned the functor category *s/n*, denoting a function that applies to a name and yields a sentence. A transitive verb is likewise assigned the category, denoting a function that applies to a name to yield an intransitive verb phrase.

The combination of functors and arguments is sanctioned by highly general rules. The formulation of these rules depends on the interpretation of the slash '/' used to represent functor categories, a notational point on which there is no general consensus across different approaches. To facilitate the comparison of alternatives, this entry adopts the convention '*result/argument*', in which arguments occur uniformly to the right of the slash and results to the left. This convention is followed by the category *s/n*, in which the name *n* is the argument and *s* is the result. The general rules of function application in Figure 12 allow a result *x* to be derived from the combination of a functor *x/y* with its argument, *y* occurring in either order.

For the sake of illustration, let us assign *Cecilia* and *Ross* the category *n*, *walks* the category *s/n*, and *bit* the category *(s/n)/n*. Then *Ross walks* will be of category *s*, the result of combining the functor *walks* with the argument *Ross*. The expression *bit Ross* will be of category *s/n*, the result of combining the *(s/n)/n* functor *bit* with *Ross*. Combining this functor with the argument *Cecilia* yields the result *Cecilia bit Ross*, which is again of category *s*. These examples highlight one of the sources of complex slash notations. The simple convention adopted here does not specify the relative order of functors and arguments and thus fails to represent the fact that English verbs generally precede their objects and follow their subjects in declarative clauses.

There is a transparent correspondence between simple categorial systems and standard **phrase-structure grammars**. As a consequence,

(a)	$x/y\ y \Rightarrow x$	rightward or 'forward' application
(b)	$y\ x/y \Rightarrow x$	leftward or 'backward' application

Figure 12 Rules of function application.

categorial grammars were for a while regarded as notational variants of phrase-structure systems, and thought to suffer from the same descriptive limitations ascribed to standard phrase-structure systems. However, the various extended categorial formalisms have clarified some distinctive aspects of categorial systems and analyses. Reflecting their roots in logic and mathematics, categorial grammars represent a distinctively deductive approach to linguistic analysis. The derivation of a sentence is, in effect, a proof, in which lexical category assignments serve as premises and function application rules sanction the inference of a result. Although similar sorts of remarks apply, in a general way, to phrase-structure systems, the deductive structure of these systems plays no grammatical role. The grammatically significant output of a phrase-structure system consists of the trees that are defined, directly or indirectly, by its phrase-structure rules. In contrast, there is no 'native' notion of constituency defined by categorial systems, and it is often the inferential structure of such systems that is of primary importance.

This is especially true of the Lambek Calculus (Moortgat 1988; Morrill 1994), which represents one of the purest deductive systems applied to the task of linguistic description. Of particular importance in this system are rules that permit the inference of higher-order functors. The **type-raising** rule in Figure 13(a) raises an expression of any category x into a higher-order functor, which applies to an argument of category x/y and yields a result of category y. The rule of **division** in Figure 13(b) likewise divides the elements of a functor by a common category z.

To clarify the effect of such rules, let us apply type raising to the expression *Ross*, substituting s for y in Figure 13(a). Since *Ross* is initially assigned the category n, the raised functor is of category $s/(s/n)$, a functor from intransitive verbs to sentences. This analysis permits an alternative derivation of the sentence *Ross walks* in which *Ross* is the functor and *walks* is its argument. Moreover, *walks* can also undergo type raising, yielding the higher-order function $s/(s/(s/n))$. This functor applies to type-raised arguments like *Ross* and restores the function–argument relations determined by the original category assignments. The process of categorial 'ratcheting' can be continued indefinitely, yielding an infinite number of derivations of the sentence *Ross walks*. This property of categorial systems with flexible type-assignment rules is sometimes termed the 'spurious ambiguity' problem, since there is no semantic difference between analyses.

(a)	$x \Rightarrow y/(y/x)$	type raising or 'lifting'
(b)	$x/y \Rightarrow (z/x)/(z/y)$	division or 'Geach's rule'

Figure 13 Category inference rules.

Nevertheless, higher-order types may permit new combinations, notably in conjunction with rules of **function composition**. The rules in Figure 14 allow two functors f and g to form a composed functor, fog, which applies to the argument of g and yields the result of f.

The interaction of type raising and composition is explored most systematically in combinatory categorial grammar (Steedman 1996), in which these devices form the basis of a variable-free treatment of extraction. The basic idea is that a chain of composed functors can 'pass along' information about an extracted element. This analysis can be illustrated with reference to the embedded question in *I wonder* [*who Cecilia has bitten*]. Let us first assign *bitten* the transitive verb category $(s/n)/n$, and provisionally assign the auxiliary *has* the category $(s/n)/(s/n)$, denoting a function from verb phrases to verb phrases. The function application rules in Figure 12 provide no means of combining these elements with the element *Cecilia*. However, if *Cecilia* is assigned the raised type category $s/(s/n)$, Figure 14(a) will sanction the composed functor *Cecilia has*, which is also of category $s/(s/n)$.

This functor can in turn compose with *bitten*, yielding the functor *Cecilia has bitten*. This functor is of category s/n, i.e. a sentence with a missing argument. By combining type raising and composition in this way it is possible to propagate information about a missing element across an unbounded domain, to the point at which its 'filler' – *who*, in this case – occurs.

(a)	$x/y \;\; y/z \Rightarrow x/z$	rightward or 'forward' composition
(b)	$y/z \;\; x/y \Rightarrow x/z$	leftward or 'backward' composition

Figure 14 Rules of function composition.

This simple example illustrates the important point that categorial derivations may contain sequences that do not correspond directly to units in constituency-based grammars, though analogues of composition are employed in some versions of HPSG. A rather different departure from standard models of constituency is characteristic of the syntactic component of Montague grammars. In contrast to the rigidly concatenative Lambek and combinatory systems, the syntactic fragments developed within the Montague tradition (Bach 1980; Dowty 1982; Jacobson 1987) propose non-concatenative 'wrap' operations to describe syntactically discontinuous constructions. For example, wrap operations permit an analysis of the verb–particle construction *put the rabbit out*, in which the object *the rabbit* is interposed between the parts of a complex transitive verb, *put out*. Similar analyses are applied to resultatives, ditransitives and various other constructions that, in one way or another, resist analysis in terms of a rigidly continuous syntactic description.

These analyses exploit a general distinction between syntactic rules and the combinatory operations that they perform. The function application rules in Figure 12 concatenate adjacent functors and arguments, though they could just as well be formulated to attach an argument to the head of a complex functor. The categorial effect of the rule would be the same; only the form of the derived expression would change. Although this distinction is of considerable linguistic interest, it is largely independent of the core deductive properties of categorial systems. Hence, contemporary categorial approaches have tended to standardise on Lambek or combinatory systems. On the other hand, the contrast between rules and operations corresponds to an important distinction between dominance and precedence constraints in GPSG and HPSG. Hence it is in linearisation approaches that one sees the clearest development of syntactic insights from Montague grammar.

General remarks

Space constraints preclude a comprehensive discussion or even an exhaustive list of related approaches. Nevertheless, it is appropriate to mention a couple of frameworks that are of particular relevance to those described above. **Tree Adjoining Grammars** (**TAGs**; Joshi and Schabes 1996) introduce a distinction between initial and auxiliary trees that effectively isolate the recursive component of a phrase-structure grammar. In addition to their use for primary description and analysis, TAGs provide a 'normal form' for investigating other grammar formalisms. For example, the formal properties of 'weakly context sensitive' formalisms, such as head grammars or combinatory categorial grammars, can often be determined by translating or 'compiling' these formalisms into a corresponding TAG whose properties have been or can be established. Models of construction grammar (Kay and Filmore 1999) can also be seen to complement other constraint-based approaches, though in a more empirical way, by supplying fine-grained lexical analyses that extend high-level descriptions of possible constructions or construction inventories.

The literature on non-transformational approaches now includes basic text books for each of the major feature-based grammars (Borsley 1996; Sag and Wasow 1999; Bresnan 2001), along with overviews (Sells 1985) and compilations (Borsley and Börjars forthcoming). These sources provide a useful entry point for linguists looking to investigate this family of approaches.

J. P. B.

Suggestions for further reading

Borsley, R.D. (1996) *Modern Phrase Structure Grammar*, Oxford: Blackwell.

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O

Optimality theory

Introduction

Optimality theory maintains that universal constraints of grammar may conflict with each other. Building on this premise it develops a theory of human language where cross-linguistic variation emerges from the possible resolutions of constraint conflicts. Its creators, Alan Prince and Paul Smolensky, first publicly examined the consequences of this hypothesis in a course at the University of California at Santa Cruz in 1991. A comprehensive written presentation that explained the formal properties of optimality theory and its application to phonology followed in 1993 and was eventually published in 2004. Since then optimality theory has become the main analytical framework in generative phonology while at the same time making its influence felt across a wide range of disciplines, including syntax, semantics, pragmatics, historical linguistics, psycholinguistics, sociolinguistics, language learning, computational linguistics and cognitive science.

Core structure

Under optimality theory the universal constraints of grammar are ranked into constraint hierarchies. Each hierarchy identifies the grammar of a language by dictating how conflicts are to be resolved, namely by letting lower ranked constraints be violated as much as is necessary to best comply with higher ranked ones. Different hierarchies involve different precedence relations among the conflicting constraints and therefore determine different conflict resolutions. Cross-linguistic variation thus emerges naturally and inevitably from the distinct resolutions made available across all the possible constraint hierarchies rather than via exceptional properties stipulated for each individual language (some examples follow in the next section).

This model relies on a new definition of grammaticality. Since the simultaneous satisfaction of conflicting constraints is impossible, grammaticality cannot depend on it as it does in other frameworks. Grammatical status is instead a property that holds with respect to an entire grammar: a structure is grammatical when it provides an optimal resolution of the available conflicts, i.e. one where the conflicts are resolved in accord with the constraint hierarchy that identifies each specific grammar. Optimal structures might therefore violate a constraint, but always minimally, and only where required by the grammar, i.e. when the incurred violations are necessary to avoid further violations on higher ranked constraints.

The optimal structures are sought within the set GEN containing all conceivable linguistic structures. This set, which is implicit in any theory of grammar, identifies the structural constructs for which the question of grammatical status can be posed. In optimality theory, GEN must be defined explicitly. It contains every structure that can be generated from a predefined set of general structure-assembling rules freely applied to a simple input form. For example, within phonology the input form can be the underlying form of a word, in which case GEN will contain every conceivable surface realisation generated from a free manipulation of individual phonological segments. In syntax,

the input may consist of an enumeration of lexical items coupled with a thematic and tense specification and GEN may contain any conceivable structure obtainable from the input by freely merging lexical items into syntactic structures and by applying any number of movement and structure-building operations.

The optimal structures for a specific grammar emerge from the application of the universal constraints to the members of GEN in the order specified by the corresponding constraint hierarchy. Each constraint acts as a filter function. Given a set of structures, a constraint returns those that violate it the least and eliminates all the others. Starting with the highest constraint applied to GEN, each constraint is applied in turn, with each constraint potentially reducing the set of surviving structures. The structures returned by the lowest constraint are the optimal, grammatical, structures. Formally, the optimal structures identified by a hierarchy H = C1C2 … Cn (by descending order) on an input I coincide with the set of structures returned by the constraint functions when applied according to the order H, see (1) below (Prince and Smolensky 1993/2004; Samek-Lodovici and Prince 1999).

(1) Optimal structures =
Cn(Cn-1(… (C2(C1(GEN(I))) …))

Example 1: Syllabification and epenthesis

Constraint ranking and optimisation are well illustrated by the analysis of the conflict between the constraints ONSET, against onsetless syllables, and DEP-IO, against epenthesis, and the related effects on the distribution of epenthesis in Classical Arabic (Prince and Smolensky 1993: 24–7). Following standard optimality-theory practice, the analysis is presented in tableaux format in Tableaux 1 below with the constraints listed in the top row by decreasing rank. Here ONSET dominates DEP-IO, a relation conventionally represented as 'ONSET >> DEP-IO'. The top-left corner contains the input, here the underlying form /al-qalamu/ (the-pen). The rest of the first column usually contains the relevant structures of GEN, i.e. those outputs that are top performers on at least one constraint, since all other forms can be proved to be inevitably suboptimal (Samek-Lodovici and Prince 1999). This tableaux, instead, includes a sample of potential output realisations involving zero or more freely located epenthetic glottal stops including the attested optimal form, conventionally identified by the symbol '☞'. The asterisks represent the constraint violations incurred by each form, while the exclamation mark identifies fatal violations where a form performs worse than the optimal one and is therefore discarded.

In Tableaux 1, (b) is optimal because it violates ONSET and DEP-IO minimally, compatibly with the ranking ONSET >> DEP-IO. The constraint DEP-IO is violated only as much as required by the higher-ranked ONSET to provide an initial onset to /al-qalumu/. No other output performs better than (b). Output (a) violates DEP-IO less than (b) but leaves the initial syllable onsetless, thus violating the higher ranked ONSET. Output (c) inserts the glottal stop in the wrong place, thus again leaving the initial syllable onsetless and violating ONSET. Output (d) violates DEP-IO a second time through a second unnecessary glottal-stop, considering that the underlying form /al-qalamu/ already provides suitable onsets for its non-initial vowels. These ungrammatical outputs show that optimality-theory constraints are not freely violable: unnecessary violations translate into ungrammatical status. They also show that lower-ranked constraints remain active: DEP-IO violations make (d) ungrammatical.

Despite its simplicity, the above example also illustrates some of the conceptual advantages of optimality theory over rule-based analyses. The conflict between ONSET and DEP-IO determines both why and where epenthesis occurs. It occurs in order to comply with universal constraints of phonological well-formedness, here ONSET. Yet its application is restricted by DEP-IO to those positions where ONSET cannot be satisfied in any

Tableaux 1

/al-qalumu/	ONSET	DEP-IO
a. al.qa.lu.mu	*!	
☞b. ?al.qa.lu.mu		*
c. al.qal.?u.mu	*!	*
d. ?al.qal.?u.mu		**!

other way. In contrast, a rule for epenthetic insertion would have to recapitulate the final distribution of epenthesis in its triggering domain, thus failing to identify the factors that govern the distribution in the first place.

Example 2: syntax of focus

The emergence of cross-linguistic variation from distinct constraint rankings is illustrated by the analysis of prosody-induced structural focus (Zubizarreta 1998). The simplified analysis presented here involves the constraints EPP, requiring subjects to occur in specTP (Grimshaw 1997; Chomsky 1982), and the constraint RIGHTMOSTSTRESS ('RS'), violated once for every word separating stress from the clause right edge (based on Chomsky and Halle 1968; Selkirk 1995). Focus is marked by the subscript 'F' and all structures in GEN are assumed to match stress with focus (for a more complete analysis see Samek-Lodovici 2005).

As Tableaux 2 shows, when the entire clause is focused the two constraints do not conflict and the SVÓ clause, with rightmost stress, in (a) outperforms both output ŚVO, without rightmost stress, in (b), and output VOŚ with a stressed post-verbal subject, in (c). Since conflict is absent, (a) is optimal under either ranking of EPP and RS, predicting a convergence between the corresponding grammars.

When focus is restricted to subjects, as shown in Tableaux 3, output (a) is no longer in GEN due to its focus stress mismatch. A conflict between EPP and RS becomes inevitable, with output $\acute{S}_F$VO, attested in English, optimal under the ranking EPP >> RS, and output VO$\acute{S}_F$, attested in Italian, optimal under the ranking RS >> EPP.

Three general properties of optimality theory characterise the above analysis.

Tableaux 2

Focused clause			EPP	RS
☞	a.	$[S\ V\ \acute{O}]_F$		
	b.	$[\ \acute{S}\ V\ O]_F$		*!*
	c.	$[\_\ V\ O\ \acute{S}]_F$	*!	

First, cross-linguistic variation emerges from the conflict between universal constraints. Variation is restricted to those contexts where constraints conflict, thus predicting convergence under clause-wide focus and divergence under subject focus.

Second, the diverging structures remain shaped by universal constraints rather than by language-specific conditions. It is thus not accidental that the structures for focused subjects still comply with one or the other of the constraints responsible for the $[SV\acute{O}]_F$ structure shared under clause-wide focus. A theory of cross-linguistic variation based on language-specific conditions would predict far more radical variation.

Finally, under optimality theory, variation within a language and variation across languages are inherently linked. For example, the conflict between RS and EPP in the above analysis is at once responsible for the cross-linguistic variation in the expression of focused subjects as well as for the language internal alternation concerning the position of focused and non-focused subjects in the languages with the RS >> EPP ranking. While the constraints and structures inevitably change, these three properties are fully general and apply to any optimality analysis.

The wider debate

Optimality theory is frequently criticised for the excessive number of languages it allegedly predicts. A set of n universal constraints yields n! = 1·2·3·…·(n-1)·n factorial distinct rankings. This number grows very fast, reaching very large numbers even for relatively small choices of n. For example, 8 constraints determine 40,320 rankings. The expected n! rankings, however, may select n! distinct optimal outputs only when every constraint conflicts with every other constraint. Actual analyses suggest that this is not the case. Typically, conflicts are restricted to

Tableaux 3

Focused subject			EPP	RS
b.		$\acute{S}_F\ V\ O$		**
c.		$\_\ V\ O\ \acute{S}_F$	*	

groups of few constraints, with no, or very limited, interactions across constraint groups. This restricts the number of distinct languages determined via constraint re-ranking. Even within each constraint group, only some of the constraints will conflict on any given input, thus delimiting the predicted typology even further.

A second widespread criticism concerns the identification of the optimal structures. Tableaux like those presented above suggest an endless number of comparisons between the optimal forms and the infinite structures in GEN. Optimality tableaux should instead be viewed as compact demonstrations of optimal status, showing how alternative structures beating the optimal ones on specific constraints inevitably induce more violations on higher constraints. The tableaux are not meant to provide an efficient algorithm for the computation of the optimal form and do not entail that an endless set of pairwise comparisons is a necessary component of that algorithm. Research on the computational aspects of the theory has shown that given plausible restrictions on the nature of the constraints the optimal form can be computed efficiently in finite time. For example, Tesar (1995) showed that when constraints are assessable with respect to information local to the structural description of output forms, the optimal structure can be determined via dynamic programming algorithms in finite time. More recently Riggle (2004a, 2004b) proposed a computational model of optimality theory where constraints combine together into a single finite state machine that for any input determines the set of optimal forms for all possible constraint rankings in finite time.

The set of linguistic disciplines adopting an optimality theoretic perspective is increasing. Within generative linguistics optimality theory has become the analytical framework of choice for phonological studies (see McCarthy 2004 for a collection of important works in this area). Significant applications have also been proposed for syntax, semantics and pragmatics (for collected articles on these topics see, among others, Barbosa et al. 1998; Legendre et al. 2001; Blutner and Zeevat 2004; Samek-Lodovici 2007. For applications to historical linguistics and sociolinguistics see McCarthy 2002 and Holt 2003).

Another particularly active area of research is language acquisition, which has both contributed and profited from the study of the formal and computational properties of the theory; see among others Tesar and Smolensky (2000) and Riggle (2004a) who provide a discussion of the most relevant issues. Research in this area has also contributed to a wider exploration of the cognitive and psychological implications of optimality theory; see in this respect the fascinating research in Smolensky and Legendre (2006) which bridges the gap between neural networks and the symbolic systems manipulated by human grammars, viewing optimality theory as the symbolic formalism that emerges from the patterns of activity determined by neural networks.

V. S.-L.

Suggestions for further reading

The Rutgers Optimality Archives (www.roa.rutgers.edu) offer a collection of freely downloadable articles across all linguistic areas.

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P

Philosophy of language

Introduction

Grayling (1982: 173–5) distinguishes between the **linguistic philosophers**, whose interest is in solving complex philosophical problems by examining the use of certain terms in the language, and **philosophers of language**, whose interest is in the connection between the linguistic and the non-linguistic – between language and the world. This connection is held by philosophers of language to be crucial to the development of a **theory of meaning**, and this is their central concern.

The ideational theory of meaning

Let us begin by examining a very early theory of meaning, one that assumes meaning is attached to, but separable from words, because it originates elsewhere; namely, in the mind in the form of ideas. This theory was developed by the British empiricist philosopher John Locke (1632–1704), and is commonly known as the **ideational theory of meaning**. Locke (1690/1977: book 3; Chapter 2) writes:

> *Words are sensible Signs, necessary for Communication.* Man, though he have great variety of thoughts, and such from which others as well as himself might receive profit and delight; yet they are all within his own breast, invisible and hidden from others, nor can of themselves be made to appear. The comfort and advantage of society not being to be had without communication of thoughts, it was necessary that man should find some external sensible signs, whereof those invisible ideas, which his thoughts are made up of, might be known to others. For this purpose nothing was so fit, either for plenty of quickness, as those articulate sounds, which with so much ease and variety he found himself able to make. Thus we may conceive how *words*, which were by nature so well adapted to that purpose, came to be made use of by men as the signs of their ideas; not by any natural connexion that there is between particular sounds and certain ideas, for then there would be but one language amongst all men; but by a voluntary imposition, whereby such a word is made arbitrarily the mark of such an idea. The use, then, of words, is to be sensible marks of ideas; and the ideas they stand for are their proper and immediate signification.

The theory underpinning Locke's view is, then, that language is an instrument for reporting thought, and that thought consists of successions of ideas in consciousness. As these ideas are private, we need a system of intersubjectively available sounds and marks, so connected to ideas that the proper use of them by one person will arouse the appropriate idea in another person's mind.

A major problem with this theory is that it does not explain how we can discover what the proper use of a word is. Ideas are private, so how can I know that when I use a word to stand for an idea of mine, the idea that that word evokes in your mind is like my idea? I cannot have your idea, and you cannot have mine, so

how is it possible for us to check that our theory of meaning is correct? This problem is not solved by trying to clarify the notion of 'idea', or by reformulating the theory in such a way that 'idea' is replaced with the term, 'concept'; *any* referent posited in speakers' minds is going to be affected by the problem. In Locke's theory, God acts as guarantor of sameness of meaning (see Locke 1690/1977: book 3; chapter 1); but, as Peirce (1868) among others has pointed out, to say that 'God makes it so' is not the type of explanation we typically seek in the sciences, whether natural or human.

A further difficulty with Locke's view is that it assumes that meaning existed before its linguistic expression in the form of thoughts in the mind. But, as Grayling puts it (1982: 186–7):

> It is arguable whether thought and language are independent of one another. How could thought above a rudimentary level be possible without language? This is not an easy issue to unravel, but certain observations would appear to be pertinent. For one thing, it is somewhat implausible to think that prelinguistic man may have enjoyed a fairly rich thought-life, and invented language to report and communicate it only when the social demand for language became pressing. Philosophical speculation either way on this matter would constitute *a priori* anthropology at its worst, of course, but it seems clear that anything like systematic thought requires linguistic ability to make it possible. A caveman's ability to mull over features of his environment and his experience of it, in some way which was fruitful of his having opinions about it, seems incredible unless a means of thinking 'articulately' is imputed to him. The net effect of the 'private language' debate, instigated by some of Wittgenstein's remarks in the *Philosophical Investigations*, strongly suggests that language (this 'articulateness') could not be an enterprise wholly private to some individual, but must be, and therefore must have started out as, a shared and public enterprise.
>
> Moreover, it appears on reflection plausible to say that the richer the language, the greater the possibility its users have for thinking discriminatively about the world. An heuristic set of considerations in support of this thought might go as follows. Consider two men walking through a wood, one of whom is an expert botanist with the name of every tree and shrub at his fingertips, and a command of much floral knowledge. The other man, by contrast, enjoys as much ignorance of botany as his companion enjoys knowledge, so that his experience of the wood is, on the whole, one of a barely differentiated mass of wood and leaf. Plainly, possession of the botanical language, and all that went into learning it, makes the first man's experience of the wood a great deal richer, more finely differentiated, and significant, *qua* experience of the wood as a wood, than is the second man's experience of it. Of course the second man, despite his botanical ignorance, might have poetic, or, more generally, aesthetic experiences arising from his woodland walk, which leave the first man's scientific experience in, as we say, the shade; but the point at issue here is the relevance of their relative commands of the language specific to making their experience of the wood *qua* wood more and less finely discriminative respectively. So much is merely speculative. It does however show that the question whether language and thought are independent is more likely to merit a negative than an affirmative answer, in whatever way one is to spell out the reasons for giving the negative answer.

The argument from Wittgenstein's *Philosophical Investigations* (1953/1968), the **private-language argument**, merits further comment. By a **private language**, Wittgenstein means 'sounds which no one else understands, but which I "appear to understand"' (1953/1968: 169), and his argument is directed against the view according to which such a language is private in the sense that no one else could learn it because of the private nature of its referents. So when he says 'private language' he means a language which is necessarily unteachable – as Locke's ideational language would be because one

person could not teach it to another by showing that other person the idea that a word stood for.

Any such private, necessarily unteachable language would have to be about sense data, entities very like Locke's ideas in many respects, and it could have no links with physical objects, since it would then be possible to use these links as **teaching links** – it would be possible to use them to teach the language to others. So a word in a private language would have to get its meaning by being correlated with a private sensation – otherwise, the language would not be private. Because of the private nature of the sensation that was the meaning of the word, the meaning of the word could not be taught to somebody else.

Pears presents Wittgenstein's argument against the idea that such a language could exist, as follows (Pears 1971: 159). Suppose you were trying to use such a language; then

> there would be for any given statement that you might make only two possibilities: either you would be under the impression that it was true, or you would be under the impression that it was false. Neither of these two possibilities would subdivide into two further cases, the case in which your impression was correct, and the case in which your impression was incorrect. For since your statements would have been cut off from their teaching links, there would be no possible check on the correctness of your impressions. But it is an essential feature of any language that there should be effective rules which a person using the language can follow and know that he is following. Yet in the circumstances described there would be no difference between your being under the correct impression that you were following a rule and your being under the incorrect impression that you were following a rule, or, at least, there would be no detectable difference even for you. So there would be no effective rules in this so-called 'language'. Anything you said would do. Therefore, it would not really be a language, and what prevented it from being a language would be the thing that prevented it, indeed the only thing that could prevent it from being teachable. Therefore, there cannot be a necessarily unteachable language.

Most present-day philosophy of language could be seen to be concerned in some way or other with the nature of what might serve as 'teaching links' and, obviously, reference to things in the world (which appear to be there for the sharing) seems a very useful teaching aid. We shall now turn to theories of meaning concerned with the nature of reference from language to items in the world.

Sense and reference

Let us assume that words mean by referring to objects and states in the world. Until the end of the nineteenth century, it was generally thought that the relationship of words to things was one of what might be called **primitive reference**, as expressed by Russell (1903: 47): 'Words have meaning, in the simple sense that they are symbols that stand for something other than themselves'. The meaning of a word *is* the object it stands for – words are labels we put on things, and the things are the meanings of the words. Then names and definite descriptions will stand for objects, while verbs, adjectives, adverbs and prepositions will stand for properties of, and relationships between, objects. In addition, there would be **syncategorematic** words, function words, which get their meaning 'in context' – there being, for instance, no ifs and buts in the world for *if* and *but* to refer to.

In the case of general terms, we can say that they refer to classes of things; so whereas *that cow* and *the cow over there* will refer to a particular cow, *cows* and *the cow*, as in *The cow is a mammal* will refer to the class of all cows; this class is the **extension** of the term *cow*. Exactly how a speaker is supposed to be able to refer to the class of all the cows there are, ever have been and ever will be, when using the general term, is one of the problems involved in the theory of primitive reference.

Some semanticists prefer to reserve the term **reference** for what speakers do: by their use of words, speakers **refer** to things, but the thing referred to is the **denotation** of a word. So words denote, and speakers refer. I shall not draw this distinction in the following.

According to the theory of primitive reference, then, the sentence *Socrates flies* gets its meaning in the following way: *Socrates* means by referring to Socrates; flies means by referring to the action of flying; *Socrates flies* says of the man Socrates that he has the property of flying – that is, it says of Socrates that he **satisfies** the predicate *flies*. So the sentence names a state of affairs in the world, or refers to a state of affairs in the world, which is handy, since we can then check up on the accuracy of the sentence by seeing whether the state of affairs referred to in it actually obtains in the world: we can identify the referent of *Socrates* and check to see whether he is flying.

There are three insoluble problems inherent in this theory:

- How can true identity statements be informative?
- How can statements whose parts lack reference be meaningful?
- How can there be negative existential statements?

These questions cannot be answered from the standpoint of a theory of primitive reference; and since there are true, informative, identity statements, such as *The morning star is the evening star*, and since there are meaningful statements whose parts lack reference such as *The present king of France is bald*, and since there are negative existential statements such as *Unicorns do not exist*, the theory of primitive reference cannot be correct. This was demonstrated by Gottlob Frege, who showed in his article 'On Sense and Reference' (1892/1977c) how the first two questions could be answered; he dealt with the third question in two articles, 'On Concept and Object' (1892/1977b) and 'Function and Concept' (1891/1977a).

The first problem is this: if the meaning of a word is its reference, then understanding meaning can amount to no more than knowing the reference. Therefore, it should not be possible for any true identity statements to convey new information; $a = b$ should be as immediately obvious to anyone who understood it as $a = a$ is, because understanding *a* and understanding *b* would simply amount to knowing their references. If we knew their references, we would know that the reference of *a* was the same as the reference of *b*, so that no new information would be being conveyed to us in a sentence like $a = b$.

However, many such true identity statements do, in fact, convey new information; for instance, that the morning star is the evening star was an astronomical discovery, and by no means a truism. Consequently, there must be more to understanding the meaning of a term than knowing what it refers to, and Frege suggested that, in addition to that for which a sign stood, 'the reference of the sign', there was also connected with the sign 'a sense of the sign, wherein the mode of representation is contained'. Then (Frege 1892/1977c: 57), 'the reference of "evening star" would be the same as that of "morning star" but not the sense'.

Sense is the identifying sound or sign by means of which an object is picked out – it is a kind of verbal pointing; and understanding meaning amounts to knowing that this particular object is at this particular time being picked out by this particular sense. So (1892/1977c: p. 61): 'A proper name (word, sign, sign combination, expression) *expresses* its sense, *stands for* or *designates* its reference'.

The new information in a true statement of identity amounts, then, to the information that one and the same referent can be picked out by means of the different senses. The circumstance that *the morning star* stands for the same as that for which *the evening star* stands, is not just a fact concerning relationships within language, but is also a fact about the relationship between language and the world, and the identity relation does not hold between the senses, but between objects referred to by the senses. Things are not the meanings of words; meaning amounts, rather, to the knowledge that a particular sense stands for a particular reference.

It is now also possible to solve the second question, concerning expressions that have no reference. These need not now be taken as meaningless for lack of reference; instead their meaning will reside in their sense alone: *The present king of France* is not meaningless just because it lacks reference, since it still has sense. Frege thought that it was a fault of natural language that it allowed a place for reference-lacking expressions – in a logically perfect language, every expression would have a sense – and he

posited the fall-back reference 0 for reference-lacking natural-language expressions. Such lack of confidence in natural language is not likely to endear a philosopher to linguists.

While it may seem fairly obvious that objects are going to serve as references for names and definite descriptions, it is less obvious what should serve this function for whole sentences. What is the reference for *I am going home now?* Is it, perhaps, the fact in the world consisting of me going home now? If so, then the reference of *You are going home in two hours* would have to be the fact in the world consisting of you going home in two hours. Facts of this kind are clearly not such nice referents as objects are, and the world would be rather crowded with them. But, worst of all, adopting this type of strategy could tell us nothing of the way in which word meaning contributes to sentence meaning; that is, it could not account for sentence structure.

In fact, Frege extended his theory to take in whole sentences in the following manner: we know that keeping the references of the parts of a sentence stable, we can refer to them by means of different senses. What, now, is to count as the sense of a whole sentence? Take the two sentences:

1. The morning star is a body illuminated by the sun.
2. The evening star is a body illuminated by the sun.

Here, the senses expressed by the nominal groups that are the grammatical subjects in the sentences differ from each other while their references remain the same. Because the senses differ, one person might believe one of the sentences, but not the other (Frege 1892/1977c: 62): 'anybody who did not know that the evening star is the morning star might hold the one to be true, the other false'. This indicates that the two sentences express different *thoughts;* the **sense** of a whole sentence, then, is the thought expressed in the sentence. We now need something which will serve as the *reference* for whole sentences.

Frege points out that, in the case of declarative sentences, we are never satisfied with just knowing which thought they express; we want to know, in addition, whether the sentences are *true.* He says (Frege 1892/1977c: 63):

> it is the striving for truth that drives us always to advance from the sense to the reference. … We are therefore driven into accepting the *truth value* of a sentence as constituting its reference. By the truth value of a sentence I understand the circumstance that it is true or false.

And, indeed, we can see that this circumstance remains stable in sentences (1) and (2) above when their senses are different; if (1) is true, so is (2).

Frege's full picture of linguistic meaning so far is, then, that the **sense** of a sentence is the thought it expresses, and this depends on the senses of its parts. The **reference** of a whole sentence is its truth value, and this, again, depends on the references of the parts of the sentences – for if we were to replace *the morning star* or *the evening star* in the two sentences with senses which picked out a different reference, then the sentence which resulted might well have a different truth value. Frege is thus the first philosopher of language to provide an account of semantic *structure.* The account is **truth-functional**, in that it says how the truth value of a whole sentence depends on the references of its parts.

Consequently, there are going to be sentences which have no truth value because some of their parts fail to refer. The sentence, 'The present king of France is bald' will have no truth value, because part of it, 'the present king of France', has no reference. But the sentence is not therefore meaningless – it still has its sense (and the fall-back reference 0).

We have now seen how Frege deals with the first two problems that a theory of primitive reference was incapable of solving. His solution to the third problem, of how there can be negative existential statements, is more difficult to understand, but it is interesting in that it involves an **ontology**, a theory of what there is in the world – of the fundamental nature of reality. The world, according to Frege, consists of complete entities, **objects**, and incomplete (or unsaturated) entities, **concepts**. To this distinction in the realm of the non-linguistic, the realm of reference, corresponds another in the realm of the linguistic, the realm of sense; namely, the distinction between **names** (including definite descriptions) and **predicates**. Objects exist in the realm of reference as the references for names, and concepts

exist in the realm of reference as the references for predicates. The concepts, although they are incomplete entities, *do exist;* their existence, their being, consists in having some objects falling under them and others not falling under them.

They can be compared to mathematical functions: the function of squaring, for instance, exists – it is a function we can recognise as the same again every time we apply it, although we will apply it to different arguments. And every time we apply it to an argument, we obtain a **value**. The square of two, for instance, is the value four. We can represent the function of squaring: $()^2$, and we can represent the number two with the numeral, 2. We can see that the sign for the function is incomplete or unsaturated, but that we can complete it by inserting 2, the sign for the number in the empty brackets giving $(2)^2$. The value for this is four, represented by the numeral 4, and we can write $(2)^2 = 4$. In other words, $(2)^2$ has the same referent as 4 does – they appear to be different senses by means of which the referent, four, can be picked out; and just as *the morning star is the evening star* has a truth value, namely true, so does $(2)^2 = 4$; and, again, if we change one of the senses in the mathematical expression for another with a different reference, we may get a different truth value, while keeping the references stable and changing the senses will not produce such an alteration of truth value.

The comparison with mathematical functions is important, because in his argument Frege needs to show that just as it is possible to apply one mathematical function to another – we can, say, work out the square root of the square on four – there are linguistic expressions which are **second-order predicates**, and Frege insists that existence is one of them. The problem now concerning Frege is that there can be true negative existential statements like *Unicorns do not exist.* According to the primitive theory of reference, this statement ought to be a contradiction because, having said *unicorns*, unicorns would have been labelled, so they must exist.

But, quite apart from this problem, existence had puzzled philosophers for a long time. Consider the sentences (following Moore 1936):

3. Some tame tigers growl and some do not.
4. Some tame tigers exist and some do not.

While (3) seems perfectly acceptable, (4) is very odd indeed, and it looks as if existence is not a predicate that functions like other predicates in the language. On Frege's theory, we can say that the oddity resides in the fact that sentence (4) looks as if it is saying of some objects that they do not exist, while it is not, in fact, possible for objects not to exist. If they are objects, then they exist. However, recall that it is possible for *concepts* not to be realised – indeed, their very being consists in being or not being realised by having objects falling under them. So, if there are second-order concepts, which have other concepts, rather than objects, falling under them, and if existence is one of these, then *exists* can still count as a predicate.

But a problem remains. For in sentences like

5. Homer did not exist.
6. Unicorns do not exist.

Homer and *unicorns* are names, and names stand for objects. But we have just decided that existence ought to be predicated, not of objects, but of other concepts. So Frege is forced, once again, to say that natural language is somehow defective: it obscures the fact that existence is a second-order concept taking other concepts as arguments. In (5) and (6) above, *did/do not exist* is completed with names. But Frege says that this surface structure hides an underlying logical structure something like:

	Predicate	*Predicate*
7.	There was not	a man called Homer.
8.	There are not	things called unicorns.

In these cases, the second predicates are first-order predicates, and the first ones represent the second-order predicate, existence, whose being is assured by having some first-order predicates falling under it and others not falling under it. So existential statements, although they look like statements about objects, are in fact statements about concepts, and they say that a particular concept is or is not realised.

Once again, though, Frege has alienated himself from a good section of the linguistic community by judging natural language defective. Nevertheless, his influence on linguistic semantics has been enormous; the whole enterprise of

studying sense relations derives from his distinction between sense and reference, and he was instrumental in the development of propositional calculus, on which linguistic semanticists also draw; it was Frege who succeeded in taming terms such as *all*, *every*, *some* and *no*, which the theory of primitive reference had had great difficulties with. A sentence like *All men are mortal* was seen as a simple proposition about men, which was, however, conceptually complex, the complexity having to do with our inability to conceive, in using it, of all the men there are, ever have been and ever will be. On Frege's theory, this sentence hides a complex proposition: *For all x, if x is a man, then x is mortal*, and this simply means that the proposition *if x is a man, then x is mortal* holds universally. There is therefore no longer any problem about the way in which *all* modifies the way in which *men* refers to the class of men. The **logical constants**, *all*, *some*, *any* and *no*, are simply part of the metalanguage we use for talking about propositions.

Frege also made what Dummett (1973) has called the most important philosophical statement ever made; namely, that it is only as they occur in sentences that words have meaning. And, as Davidson (1967: 22) adds, he might well have continued 'that only in the context of the language does a sentence (and therefore a word) have meaning'. Many linguists would be prepared to embrace him for this statement alone.

Logical positivism

In spite of his great achievements, however, problems were soon perceived in the Fregean picture of linguistic meaning. Logicians found it difficult to accept that there could be statements that did not have truth values, because it is one of the founding principles of logical systems that a proposition is either true or false. Furthermore, Frege's theory proved inconsistent with the logician's truth table for *or*, '∨' [*see* FORMAL LOGIC AND MODAL LOGIC].

P	Q	P ∨ Q
T	T	T
T	F	T
F	T	T
F	F	F

According to Frege's theory, any sentence some of whose parts fail to refer is going to lack truth value. So the sentence, '*Either* she does not have a cat *or* her cat eats mice' will lack a truth value if she has no cat – because the sentence part *her cat* will fail to refer. But, according to the truth table, the sentence is true, because, as she has no cat, the first disjunct is true.

Finally, Davidson (1967: 20) indicates a further weakness. Frege says that a sentence whose parts lack reference is not therefore meaningless, because it will still have its sense. But if we are enquiring after the meaning of the reference-lacking *the present king of France*, it is singularly unhelpful to be told that it is *the present king of France*, the sense. Yet, since there is no reference, this is all the answer we could be given.

Faced with such problems, a group of philosophers known as the logical positivists of the Vienna Circle tried to amend Frege's theory in such a way as to retain its strengths while removing its weaknesses. They began by trying to provide a consistent and satisfactory theory of meaning for at least a limited number of natural language sentences. Which set is specified in Alfred Ayer's (1936/1971: 48) **criterion of meaningfulness**, known as the **verification principle**:

> A sentence is factually significant to any given person, if, and only if, he knows how to verify the proposition which it purports to express – that is, if he knows what observations would lead him, under certain conditions, to accept the proposition as being true, or reject it as being false.

Unverifiable sentences were said to be concerned with 'metaphysics', and not to be factually significant. Thus *God exists* is not a factually significant sentence, and nor is *God does not exist;* factually insignificant sentences may well be of great importance to some people, of course, but the logical positivists did not see them as falling within that part of the language that their philosophy should centre on.

Unfortunately, it soon became clear that very few sentences would, in fact, qualify as factually significant, so the relevant set of sentences for logical positivism to concern itself with became disappearingly small. For instance, the general

laws of science, which are of the form 'All … ' are not factually significant, since they are in principle unverifiable: you can never be sure you have examined all instances of something. History also falls by the wayside, because present observation cannot be used to verify statements about the past. And what of the verification principle itself? How can that be verified? If it cannot be verified, it itself seems factually insignificant.

For a time, it seemed that the verification principle could be verified through Moritz Schlick's (1936) **verification theory of meaning**. This is a theory of what meaning *is*, while Ayer's principle is a statement about what it is for someone to understand meaning. According to the verification theory of meaning, *the meaning of a proposition is its method of verification.* If this is true, then the verification principle is also true; for if the meaning of a proposition *is* the way in which it is verified, then to know that meaning one must know how to go about verifying it.

Schlick's theory is interesting in that it makes meaning into a *method*, rather than taking it to be an entity of some kind which attaches to words or sentences. He spells out the method: 'Stating the meaning of a sentence amounts to stating the rules according to which it is to be used, and this is the same as stating the way in which it can be verified (or falsified)'. He thought that there were certain sentences called **protocol sentences**, which consist of incorrigible reports of direct observation, and which therefore do not need to be further verified. These would provide 'unshakable points of contact between knowledge and reality' and all other factually significant sentences could be derived from them. Since protocol sentences are immediately observably true or false, it is possible to specify exactly the circumstances under which they are true, and these circumstances constitute the **truth conditions** for the sentences. Schlick's protocol sentences are essentially similar to Carnap's (1928) **meaning postulates** and Wittgenstein's (1921/1974) **elementary sentences**.

Such proposals are open to the challenge that we do not have direct access to the basic stuff of the universe because all observation is theory-laden. We bring our already formed theories about what we are observing to our observations which are therefore never objective. This objection is made forcefully by Quine (1960: chapter 2) (see below). Austin's speech-act theory was developed in reaction to the lack of progress in the philosophy of language caused by the problems involved in logical positivism [*see* SPEECH-ACT THEORY). The notion of truth conditions has, however, remained with many philosophers of language (see below), linguistic semanticists and pragmaticists.

The indeterminacy of translation

Quine's (1960: 2) objection to projects like that of the logical positivists is, briefly, that statements are never verifiable or falsifiable in isolation, and that it is impossible to find the truth conditions for individual sentences, because the totality of our beliefs about how the world is gets in the way. It is not possible to separate belief from linguistic meaning, because we do not have any access to the world independent of our beliefs about what the world is like. He argues as follows.

Imagine a linguist who is trying to interpret the language of a hitherto unknown people of a culture very different to the linguist's own. It is a friendly people, and they do their best (as far as we can tell) to assist the linguist in her or his endeavour. The linguist has chosen a native informant.

The linguist sees a rabbit running by, and the informant points to it saying '*Gavagai*'. The linguist writes in her or his notebook, '*Gavagai* means *Rabbit/Lo! A rabbit.*' S/he will test this hypothesis against the possibility that *Gavagai* might, instead, mean *White*, or *Animal*, or *Furry creature*, by checking the informant's reaction to a suggested '*Gavagai*' in the presence of other white things, other animals, and other furry creatures – it being assumed that the linguist has been able to ascertain what counts as assent and dissent in the culture. If assent is only obtained in the presence of rabbits, then the linguist will take the hypothesis as confirmed, and assume that *Gavagai* does, indeed, mean *Rabbit.*

Although this example is supposed to illustrate a philosophical argument, the method presented is in fact a fair outline of that used by linguists engaged in field study, except that Quine's example is meant to deal with **radical translation** – with the case of a completely unknown

language spoken by a people which has not previously been in contact with any other – whereas most linguists are now fortunate enough to be able to rely on informants with whom they share at least a working knowledge of some language, either that of the linguist or a third language.

Quine calls every possible event or state of affairs in the world which will prompt the informant to assent to *Gavagai* the term's **positive stimulus meaning**, and he calls every event or state of affairs in the world which will prompt the informant to dissent from *Gavagai* the term's **negative stimulus meaning**. The two sets of events and states of affairs together make up the term's **stimulus meaning**. Since the stimulus meaning for any term covers all events and states of affairs, the stimulus meaning of each linguistic term is related to every other.

But Quine now puts a serious objection in the way of the linguist's project, and in the way of any verification/falsification theory of meaning. He points out that, even when apparent stimulus synonymy has been established between two terms such as *Gavagai* and *Rabbit*, there is no guarantee that assent or dissent to their use is in fact prompted by the same *experience* (Quine 1960: 51–2):

> For, consider 'gavagai'. Who knows but that the objects to which this term applies are not rabbits after all, but mere stages, or brief temporal segments, of rabbits. In either event, the stimulus situations that prompt assent to 'Gavagai' would be the same as for 'Rabbit'. Or perhaps the objects to which 'gavagai' applies are all and sundry undetached parts of rabbits; again the stimulus meaning would register no difference. When from the sameness of stimulus meanings of 'Gavagai' and 'Rabbit' the linguist leaps to the conclusion that a gavagai is a whole enduring rabbit, he is just taking for granted that the native is enough like us to have a brief general term for rabbits and no brief general term for rabbit stages or parts.

Our theory of nature, then, is always and inevitably underdetermined by all possible 'evidence' – indeed, there is no real evidence of what somebody else's theory of nature is. This argument can equally well be used for speakers of the 'same' language – I do not have access to your experience of what we both call rabbits any more than I have to the experience of the informant in Quine's story. But this means that truth conditions are not available, so no theory of meaning can be set up in reliance on them, and interpretation of the speech of another is always radically indeterminate. What is, in my opinion, the most important development in modern philosophy of language, still in the Fregean tradition, has developed in an attempt to show that Quine's pessimism is unwarranted.

Radical interpretation

Quine's argument shows that it is probable that any theory of meaning which begins by looking for truth conditions for individual terms or sentences will fail; such truth conditions are simply not evidence which is plausibly available to an interpreter. But suppose now that we give up the search for those bits of the world which provide stimulus for speakers to assent to or dissent from sentences and that, instead of beginning our account with truth conditions for individual terms or sentences, we begin by seeing truth as (Davidson 1973: 134) 'a single property which attaches, or fails to attach, to utterances, while each utterance has its own interpretation'. That is, we could, perhaps, try initially to keep truth independent of the interpretation of individual utterances; we could see truth, not as a property of sentences, but as an attitude, the attitude of **holding an utterance true**, which is attached to speakers, rather than to their words. It is an attitude, furthermore, which it is not unreasonable to suppose that speakers adopt towards their own utterances a good deal of the time, even if we have not the faintest idea what truths they see themselves as expressing.

We are then no longer concerned to find some criterion for checking whether a sentence is true or not – which would depend on our already knowing what its truth conditions might be. Rather, we are assuming that a speaker whose words we do not understand sees her/himself as expressing some truth or other. The question is how this evidence can be used to support a theory of meaning. Perhaps we could proceed as follows: we observe that a speaker, Kurt, who belongs to a speech community which we call

German, has a tendency to utter '*Es regnet*' when it is raining near him. We could take this as evidence for the statement (Davidson 1973: 135): '"Es regnet" is true-in-German when spoken by *x* at time *t* if and only if it is raining near *x* at *t*.'

We have now used the case of Kurt to make a statement which is supposed to hold for every member of the German speech community, so we must gather more evidence, by observing other speakers and trying out *Es regnet* on them in various circumstances, rather like Quine's linguist did in the case of the rabbit. Of course, we are assuming that German speakers are sufficiently like ourselves to hold true that it is raining if and only if it is in fact raining, and Quine's suggestion was that this assumption was unjustified. But perhaps it is not (Davidson 1973: 137):

> The methodological advice to interpret in a way that optimises agreement should not be conceived as resting on a charitable assumption about human intelligence that might turn out to be false. If we cannot find a way to interpret the utterances and other behaviour of a creature as revealing a set of beliefs largely consistent and true by our own standards, we have no reason to count that creature as rational, as having beliefs or as saying anything.

Davidson is sometimes accused of Eurocentricity because of statements such as the above. But the theory is, of course, meant to work both ways – a person from the most remote culture compared to ours is supposed to be able to make use of the theory to make sense of us, just as we are supposed to be able to make sense of her/him.

The statement suggests that the moment one person tries to interpret the utterances of another, the assumption of sameness – at least at a very basic level – has already been made. If no such assumption is made, no attempt at interpretation will be made either, but any attempt at interpretation carries with it the sameness assumption. This contention is borne out by the facts: we do tend to ascribe more meaningful behaviour to things according to their similarity to ourselves – we are more likely to suggest that our neighbour is making meaningful noises than we are to suggest that our dog is doing so; but we are more likely to suggest that the dog is making meaningful noises than we are to suggest that our apple tree is signalling intentionally to us.

The theory of meaning which Davidson advocates, known as the theory of **radical interpretation**, provides a method and a conception of what meaning is which allows us to make sense of the linguistic and other behaviour of other persons, and to see how their use of certain utterances relates to their use of certain other utterances. It is important to be aware that the notion of truth with which Davidson operates is not a **correspondence theory of truth**: sentences are not made true or false because their parts correspond to bits of the world. Rather, stretches of language are taken by speakers to be appropriate to the ongoing situation. References for parts of utterances are worked out on the basis, in principle, of an understanding of the language as a whole, and the theory can accommodate variance in reference with variance in situation (see Davidson 1986). Reference is not a concept we need to use to set up the theory in the first place: it is not the place at which there is direct contact between linguistic theory and events, actions and objects. On this account, meaning is not an entity or property of an entity; it is a relation between (at least) a speaker, a time, a state of affairs and an utterance. We have, therefore, a theory of meaning compatible with many empirically based twentieth-century linguistic research projects in areas like, for instance, sociolinguistics, functional grammar, intonation, discourse analysis and text linguistics, and critical linguistics.

K. M.

Suggestions for further reading

Evnine, S. (1991) *Donald Davidson*, Palo Alto, Calif.: Stanford University Press.

Grayling, A.C. (1982) *An Introduction to Philosophical Logic*, Brighton: Harvester Press.

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Phonemics

Phonemics is the study of phonemes in their various aspects, i.e. their establishment, description,

occurrence, arrangement, etc. Phonemes fall under two categories, **segmental** or **linear** phonemes and **supra-segmental** or **non-linear phonemes** – these will be explained below. The term 'phonemics', with the above-mentioned sense attached to it, was widely used in the heyday of post-Bloomfieldian linguistics in America, in particular from the 1930s to the 1950s, and continues to be used by present-day post-Bloomfieldians. Note in this connection that Leonard Bloomfield (1887–1949) himself used the term 'phonology', not 'phonemics', and talked about **primary phonemes** and **secondary phonemes** while using the adjectival form 'phonemic' elsewhere. The term 'phonology', not 'phonemics', is generally used by contemporary linguists of other schools.

However, it should be noted that to take phonology simplistically as a synonym of phonemics may not be appropriate for at least two reasons. On the one hand, there exists a group of scholars who talk about phonology without recognising, still less operating with, phonemes, be they segmental or suprasegmental; these are **prosodists** [*see* PROSODIC PHONOLOGY] and **generativists** [*see* DISTINCTIVE FEATURES; GENERATIVE PHONOLOGY]. On the other hand, an English phonetician, Daniel Jones (1881–1967), developed a theory of phonemes wherein he talked about phonemes *tout court*, but neither 'segmental' or 'primary' phonemes nor 'suprasegmental' or 'secondary' phonemes. He did not recognise and practically never mentioned either phonemics or phonology.

Jones manifested an ambivalent attitude towards post-Bloomfieldian suprasegmental phonemes in that, on the one hand, he disagreed with the American practice of referring to suprasegmentals in terms of 'phonemes' but, on the other hand, he talked about **chronemes**, **stronemes** and **tonemes** conceived along the same line as phonemes. Jones's followers largely did not (and do not) subscribe to his chronemes and stronemes. Jones insisted that what post-Bloomfieldians called phonemics formed part of phonetics and refused to recognise a separate discipline called phonemics. Given this rather complex situation, we shall look, in what follows, mainly at post-Bloomfieldian phonemics and Daniel Jones's phoneme theory.

The first and most important task in phonemics, both for post-Bloomfieldians and Jones, is to establish the phonemes of a given language. To do this, they analyse phonetic data according to certain well-defined procedures.

Post-Bloomfieldians operate with the notions of **contrastive** and **non-contrastive**, which originally stem from the concept of **distribution** but are ultimately coloured by semantic implications. Sounds which occur in an identical context are said to be in **contrastive distribution**, or to be contrastive with respect to each other, or to contrast with each other. Such sounds are said to be **allophones** of different phonemes. For example, [p^h] and [m], which occur in an identical context in the English words *pit* and *mitt*, for example, are allophones of two different phonemes, /p/ and /m/. (It is customary to enclose symbols for phonemes by diagonal lines, and symbols for allophones in square brackets.)

However, this analytical principle does not work in all cases. For example [p̄] (unaspirated), [p̚] (unreleased), [ʔp] (preglottalised), etc., which occur in an identical context in, say, the English word *sip*, and which are therefore in contrastive distribution, are nevertheless not allophones of different phonemes, i.e. /p̄/, /p̚/, /ʔp/, etc., but allophones of one and the same phoneme /p/ in English. The allophones in this example are said to be in **free variation** and therefore to be **free variants**.

But how can one conclude that in the one case the sounds in question belong to different phonemes and in the other case the sounds in question belong to one and the same phoneme? The explanation commonly proffered is that, in English, while exchanging [p] for [m] in the context /-ɪt/ produces a change in the meaning of the word, exchanging the above-mentioned allophones of /p/ for each other in the same context does not alter the meaning of the word, but are merely variant pronunciations of the word-final phoneme /p/.

Notice that, in this explanation, recourse is had to semantic considerations or meaning despite the fact that some post-Bloomfieldians, including Bernard Bloch (1907–65), Charles Francis Hockett (1916–2000) and Zellig Sabbetai Harris (1909–92), avowedly refuse to operate with **meaning in phonemic analysis**. These post-Bloomfieldians have gone beyond their master who, while warning about the difficulty

of dealing with meaning, did not exclude the possibility of recourse to meaning in either phonemics, which he called phonology, or in linguistics in general. They have therefore attempted to devise, if not always successfully or altogether consistently, such a series of analytical procedures in phonemic analysis as are primarily founded on distributional criteria. Their avoidance, at least in principle, if not always in practice, of meaning in phonemic analysis relates to their insistence that analysis at one linguistic level should be conducted independently of analysis at any other level; semantic considerations should therefore only operate in analysis at the morphemic and semantic levels of a language.

However, a few post-Bloomfieldians, most notably Kenneth Lee Pike (1912–2000), strongly claim that it is not only desirable but necessary to take meaning into account in phonemic analysis. It is not surprising in view of these facts that one should find in much post-Bloomfieldian phonemics literature that, apart from its original distributional implications, 'contrastiveness' is presented as almost equal to **distinctiveness**, i.e. capable of differentiating words. This has given rise to post-Bloomfieldians' general use of the term 'contrast' as a synonym of the functionalists' term opposition [*see* FUNCTIONAL PHONOLOGY]; functionalists distinguish between opposition, which relates to paradigmatic relation, and **contrast**, which relates to syntagmatic relation [*see* PROSODIC PHONOLOGY].

Sounds which do not occur in an identical context are said to be in **non-contrastive distribution**. There are two subtypes. The first subtype is the following. If one of two or more sounds occurs in a context to the exclusion of other sound(s), i.e. in a context in which the other sound(s) never occur(s), they are said to be in **complementary distribution** or in **mutual exclusiveness**. For example, [h] and [ŋ] in English, as in *hat* and *ring*, are not only in non-contrastive distribution but also in complementary distribution since [h] never occurs in English in word-final position and [ŋ] never in word-initial position. Although, to post-Bloomfieldians, the occurrence of sounds in complementary distribution is a prerequisite to these sounds being allophones of one and the same phoneme, this is not the sole condition. The other necessary condition to be met is the **criterion of phonetic similarity**; that is to say, the sounds in complementary distribution must be phonetically similar to each other for them to be regarded as allophones of one and the same phoneme. This latter condition is not met in the example of [h] and [ŋ], which are consequently considered to belong to separate phonemes. One example in which both conditions are met is that of [b] in, for example, *robin* and [b̥] in, for example, *hub*, which are not only in complementary distribution but phonetically similar to each other (the diacritic mark ̥ in [b̥] signifies devoicing).

The second subtype of non-contrastive distribution is the following. The sounds in question occur in **partial complementation**, i.e. they occur in contrastive distribution in some contexts where they are allophones of different phonemes, but occur elsewhere in non-contrastive distribution or, more precisely, in complementary distribution. The reference to this type of non-contrastive distribution within an explanation of the second subtype of non-contrastive distribution may be somewhat confusing but is inevitable, given the analytical procedures which are importantly, if not exclusively, based on the criterion of distribution adopted by the majority of post-Bloomfieldians. For want of an appropriate example in English, let us consider the occurrence of [ɾ], the alveolar tap, and [r], the alveolar trill [*see* ARTICULATORY PHONETICS], in Spanish, which are in partial complementation. [ɾ] and [r] occur in contrastive distribution in intervocalic position, i.e. between two vowels (cf. *caro* [ˈkaɾo], *carro* [ˈkaro]), but in non-contrastive-distribution-cum-complementary-distribution in, say, word-initial position and word-final position (cf. *rojo* [ˈroxo], *hablar* [aˈβlaɾ]). In the context where [r] and [ɾ] occur in contrastive distribution, they are considered as an allophone of /r/ and an allophone of /ɾ/, respectively; notice that this analysis involves recourse to meaning. In the contexts where they occur in non-contrastive-distribution-cum-complementary-distribution, [r] and [ɾ] are not considered as allophones of one and the same phoneme but an allophone of /ɾ/ and an allophone of /r/, respectively, on the strength of the post-Bloomfieldian axiomatic principle of '**once a phoneme**, **always a phoneme**' (see further below). In such a case, different analyses are given by functionalists or prosodists. Thus, so far as post-Bloomfieldians

are concerned, the fact of sounds occurring in complementary distribution does not in itself necessarily lead to the conclusion that they are allophones of the same phoneme. (Compare this conclusion with the one shown in the case of the first subtype.)

The analytical procedures whereby post-Bloomfieldians establish phonemes will be seen to be compatible with their concept of the phoneme as a class of phonetically similar and complementarily distributed sounds, i.e. the criteria of phonetic similarity and complementary distribution, these sounds being generally referred to as allophones of a phoneme. Further criteria are mentioned by post-Bloomfieldians, but the above-mentioned two are of crucial importance. This concept of the phoneme is, as we shall see further below, strikingly comparable to Jones's. Note that this concept does not accommodate those allophones which occur in free variation. Some post-Bloomfieldians, however, do accommodate such allophones in their definition of the phoneme, in which case recourse to meaning is inevitably involved.

Through the analytical procedures mentioned above, post-Bloomfieldians will establish for the phonemic system of English, for example, /k/ as a class of allophones which occur in complementary distribution, these allophones being: [kʰ], which is aspirated, as in *key;* [k˭], which is unaspirated, as in *pucker;* [kˀ], which is unreleased (in some speaker's pronunciation), as in *luck;* [k̟], which is fronted, as in *keel;* [k], which is backed, as in *cool;* [k], which is neutral, as in *cur;* etc. These allophones are considered to be phonetically similar to each other. Likewise, post-Bloomfieldians establish the other consonantal phonemes and the vowel phonemes of English, or of any other language they analyse.

There is no uniform descriptive designation for each of these phonemes in the practice of post-Bloomfieldians, who variously use articulatory features to describe them, so that /p/ may be described as the voiceless bilabial plosive, and /k/ as the voiceless velar plosive, /i/ as in *feet*, as the front high, /ɒ/ as in *hot*, as the central low, etc. [*see* ARTICULATORY PHONETICS for keys to these descriptions].

To post-Bloomfieldians, and also to Jones, whose theory will be explained further below, a **phoneme** is the minimum phonemic unit that is not further analysable into smaller units susceptible of concomitant occurrence. In other words, a phoneme is a block that cannot be broken down into smaller parts; it is the smallest element relevant to phonemic analysis. Therefore, the above-cited articulatory terms should be taken not as referring to subcomponents of a phoneme, but rather as convenient mnemonic tags derived from the study of how the sounds are produced by the speech organs.

Where there appear to be two alternative phonemic analyses according to which, for example, the phonetically complex consonants, as in *church* and *judge*, may be considered as either **complex phonemes**, i.e. /tʃ/ and /dʒ/ respectively, or **simple phonemes**, i.e. /č/ and /ǰ/, respectively, post-Bloomfieldians tend to be guided by the principle of establishing as economic an inventory of phonemes as possible and therefore opt for the latter analysis.

Post-Bloomfieldians conduct their phonemic analysis with an axiomatic principle often dubbed 'once a phoneme, always a phoneme', by which it is meant that once a given sound has been identified in a context as an allophone of a phoneme, the same sound occurring in any other context must also be considered as an allophone of this same phoneme and not of any other phoneme. To use the Spanish example mentioned above, [r] has been identified as an allophone of /r/ (cf. *carro*), as this sound is in contrast with [ɾ], which has been identified as an allophone of /ɾ/ (cf. *caro*). It so happens that [r] occurs in a different context (cf. *rojo*) and [ɾ] in a yet different context (cf. *hablar*). Post-Bloomfieldians do not hesitate to consider the first as an allophone of /r/ and the second as an allophone of /ɾ/ by invoking the principle of 'once a phoneme, always a phoneme'.

At first sight, there appears to be an exception to this principle. For example, [ɾ] is considered an allophone of /t/ that occurs in, say, intervocalic position, e.g., *Betty* /ˈbeti/ [ˈbeɾi], but may also occur as an allophone of /r/ after [θ], cf. *three* [θɾiː]. However, the two [ɾ]s are regarded as allophones of two different phonemes, i.e. /t/ and /r/, without violating the axiomatic principle, because they are said to occur in 'separate' phonetic contexts – one intervocalic, the other not – and consequently to occur in **partial overlapping** when one takes into account

other contexts in which they both occur, i.e. in contrastive distribution.

Investigation into the occurrence and arrangement of phonemes is of distributional concern to post-Bloomfieldians. The phonemes of a language are specified with regard to their occurrence or non-occurrence in specific contexts such as **syllable-initial**, **-medial**, or **-final position**, or **word-initial**, **-medial**, or **-final position**, etc. For example, in English, /p/ occurs in all the positions just mentioned (cf. *pea*, *apt*, *cap*, *packet*, *upper*, *ketchup*), while /ʒ/ occurs mainly in word-medial position (cf. *measure*), but rarely occurs in word-initial position (cf. *genre*), or in word-final position (cf. *garage*). /iː/, as in *see*, occurs in all the above-mentioned positions (cf. *eat*, *feet*, *tree*), whereas /æ/, as in *rat*, occurs syllable- or word-initially (cf. *at*), and syllable- or word-medially (cf. *mat*), but never syllable- or word-finally.

Post-Bloomfieldians say that, in the contexts where a given phoneme does not occur, the phoneme is defectively distributed, hence the term **defective distribution**. It is important for post-Bloomfieldians to determine which phoneme, /p/ or /b/, in English is considered to occur after /s/ in, for example, *spit* – /spit/ or /sbit/? – since this has implications for the distributional statement about /p/ or /b/. For a different analysis on the part of functionalists, see FUNCTIONAL PHONOLOGY. The study of the distribution of phonemes can be extended to cases of clusters of phonemes; for example, in English, the cluster /mp/ is disallowed and therefore defectively distributed in syllable- or word-initial position, but is allowed in syllable- or word-final position as in *hamp*, or across morpheme boundaries, as in *impossible*.

Related to the study of the distribution of phonemes is **phonotactics**, which is the study of the permitted or non-permitted arrangements or sequences of phonemes in a given language. For example, among the permitted consonant clusters in English are the following: /spl-/, as in *spleen;* /skl-/, as in *sclerotic;* /spr-/, as in *spring;* /skr-/, as in *screw*. Note that these clusters are permitted in word-initial position only, and that /stl/ is disallowed. Further examples are /pl-/, as in *play*, /-pl-/, as in *steeply*, and /-pl/, as in *apple;* /kl-/ as in *clear*, /-kl-/, as in *anklet*, and /-kl/, as in *knuckle;* /-tl-/, as in *atlas*, and /-tl/, as in *little*. Note that /tl-/ is disallowed. Many other permitted clusters of consonant phonemes could be cited. It will have been noted that some of the permitted clusters are occurrent in certain contexts only. And it goes without saying that many theoretically possible consonant clusters are non-occurrent in English; for example, no English word begins with /zv-/.

The kind of phonemes we have seen above are referred to as **segmental** or **linear phonemes**, simply because they occur sequentially. A speech chain can be segmented into a series of such phonemes; for example, *box* /bɒks/, is a sequence of four segmental phonemes, /b/, /ɒ/, /k/ and /s/. Post-Bloomfieldians operate with what they call **suprasegmental phonemes** as well, such as

- **stress phonemes**, of which there are four: **strong** = ˊ, **reduced strong** = ˆ, **medium** = ˋ, **weak** = ∅, i.e. zero, hence no diacritic mark: all four are illustrated in *élevàtor-ôperàtor;*
- **pitch phonemes**, of which there are also four: **low** (1), **mid** (2), **high** (3), **extra-high** (4), illustrated in:

He	*killed*	*a*	*rat*	*but*	*George*	*killed*	*a*	*bird*
1	3		2–4	1	4	1		4–1

- **juncture phonemes**, of which there are at least three: **external open**, **internal close**, **internal open**, illustrated in *nitrate*, which has external open junctures before /n/ and after the second /t/ and internal close junctures between /n/, /ai/, /t/, /r/, /ei/ and /t/, and in *night-rate*, which has external open junctures and internal close junctures as in *nitrate* except that it has an internal open juncture between the first /t/ and /r/ instead of an internal close juncture. An internal open juncture is customarily indicated as /+/, hence an alternative name **plus juncture**.

Some, not all, post-Bloomfieldians operate with three additional junctures, i.e. /||/, called **double bar**, /#/, **double cross**, and /|/, **single bar**. These are used in reference to intonational directions, i.e. **upturn**, **downturn** and **level** (= neither upturn nor downturn), respectively. Suprasegmental phonemes are said

not to be linearly placed but to occur **spread over**, or **superimposed on**, a segmental phoneme or phonemes, but this is obviously not the case with juncture phonemes though their effects themselves are phonetically manifested over segmental phonemes adjacent to the juncture phonemes.

Daniel Jones maintained that the phoneme is a phonetic conception and rejected the separation of phonemics from phonetics, asserting that the two are part and parcel of a single science called phonetics. His use of the term 'phonemic', as in 'phonemic grouping' and other expressions, pertains to the phoneme, not to phonemics, a term which he does not use for his own phoneme theory. It is neither clear nor certain how much the latter benefited from the former. Jones's phoneme theory was intended for various practical purposes, including foreign pronunciation teaching and devising of orthographies, not for theoretical purposes. He excluded any reference to meaning in his so-called **physical definition** of a phoneme as a family of phonetically similar and complementarily distributed sounds – which he called **members** or **allophones** of phonemes – within a word in an idiolect. Jones meant by an **idiolect** here 'the speech of one individual pronouncing in a definite and consistent style'.

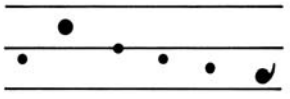
This concept of the phoneme is strikingly similar to (if not identical in detail with) that entertained by post-Bloomfieldians, who apply other criteria as well. Like post-Bloomfieldians, Jones admitted recourse to meaning as an expedient for establishing the phonemes of a language. He said that sounds occurring in an identical context belong necessarily to different phonemes and that it is phonemes which distinguish different words, not allophones of the same phoneme. He opined that a phoneme is what is stated in his definition of it and what a phoneme does is to distinguish words. Note, as Jones himself stressed, that it is a necessary corollary of his definition of the phoneme that different sounds occurring in an identical context must be members of different phonemes. A pair of words which are distinguished from each other through a difference between two phonemes, and through that difference alone, are known as a **minimal pair**. For example, *met* and *net* in English constitute a minimal pair since they are distinguished from each other only through the difference between /m/ in *met* and /n/ in *net*.

Unlike post-Bloomfieldians, Jones neither talked about nor operated with 'contrastive (distribution)' or 'non-contrastive (distribution)'. Jones's concept of the phoneme fails, like that of many post-Bloomfieldians', to accommodate those allophones that occur in free variation; such allophones are presumably accounted for by Jones through recourse to the concept of the **variphone**, i.e. a sound susceptible of being pronounced differently and erratically in an identical context without the speaker being aware of it, which Jones proposed in 1932 at an early stage in the development of his phoneme theory (Jones 1932: 23). For the concept of variphone, see Jones (1967).

Like post-Bloomfieldians, Jones took it as axiomatic that a given sound cannot be assigned to more than one phoneme, although, unlike post-Bloomfieldians, he admitted a few exceptions. For example, Jones considered [ŋ] in, say, *ink* as a member of /ŋ/, which will have been established in, say, *rung* /rʌŋ/. He therefore rejected any analysis which considered [ŋ] as being a member of /n/ occurring before /k/, as in *ink*, or before /g/, as in *hunger*. Post-Bloomfieldians will agree with Jones's analysis here.

Jones worked on **suprasegmentals**, which he called **sound attributes**, with the same analytical principle that he applied to segmentals considered in terms of phonemes and allophones, and talked about **tonemes**, a term which he coined in 1921 (see Jones 1957: 12–13; Fudge 1973: 26) – Pike in America independently invented it in the early 1940s (Pike 1948) – and **allotones**, and **chronemes** and **allochrones**, though he showed considerable reservations about **stronemes** and **allostrones**. Yet he was ultimately against considering suprasegmental phonemes as do post-Bloomfieldians and even preferred the term **signeme**, allegedly proposed by Dennis Ward (1924–2008) (see Jones 1957: 20; Fudge 1973: 32) to designate any phonetic feature, segmental or otherwise, that contributes to meaning difference, cf. the concept of significance = distinctiveness; thus, **signemes of phone** (= phonemes), **signemes of length**, **signemes of stress**, **signemes of pitch** and **signemes of juncture**. The term 'signeme' has not caught on, however.

Jones's study of **intonation** is vastly different from that of post-Bloomfieldians. Unlike them, he does not operate with a fixed number of pitches or pitch phonemes. This is obvious by merely looking at his representation of intonation, which uses a graphic transcription with a stave of three horizontal lines; the top and bottom lines represent the upper and lower limits of the speaker's voice range, and the middle one an intermediate pitch level. Unstressed syllables are indicated with small dots placed at appropriate pitch levels, while stressed syllables are indicated with large dots, which are placed at appropriate pitch levels and are accompanied with curves if the stressed syllables have either a rising, a falling, a rising-falling or a falling-rising intonation. A specimen of his intonation transcription is shown below.



We did what we were told.

Jones himself and his followers frequently omit the middle line.

In the matter of transcription, it should be noted that Jones adopted from Henry Sweet (1845–1912), and used, two different types of transcription – **broad transcription**, in which the symbols stand for phonemes (though Sweet himself did not use the term 'phoneme'), and **narrow transcription**, in which the symbols stand for allophones or members of phonemes. Jones also used the expressions **phonemic transcription** and **allophonic transcription**.

Jones's followers continue to work on the phoneme theory inherited from him with no major modifications.

Phonemics continues to be adhered to and practised, notably and predominantly in the domain ifn ELT (English Language Teaching).

T. A.

Suggestions for further reading

Bloch, B. and Trager, G.L. (1942) *Outline of Linguistic Analysis*, Baltimore, Md.: Linguistic Society of America, Chapter 3.

Hill, A.A. (1958) *Introduction to Linguistic Structures: From Sound to Sentence in English*, New York: Harcourt Brace Jovanovich, Chapters 2–6.

Jones, D. (1967) *The Phoneme: Its Nature and Use*, 3rd edn, Cambridge: Heffer.

Port-Royal Grammar

The editions of the text

The real title of what has become popularly known as *Port-Royal Grammar* is *A General and Reasoned Grammar Containing the Foundations of the Art of Speaking Explained in a Clear and Natural Way, the Reasons for What Is Common to All Languages and the Main Inferences That Can Be Found Between Them Etc.*

After its first publication in Paris in 1660, it was published again with successive additions in 1664, 1676, 1679 and 1709. In 1754, the French grammarian Duclos added to the text of 1676 'Remarks' that were regularly reprinted in later editions (1768, 1783, etc.). Moreover, the 1803 edition is preceded by an 'Essay on the Origin and Progress of the French Language' by Petitot. In the editions of 1830 (Delalain, Paris) and 1845 (Loquin, Paris), the *Logic or the Art of Thinking* by Arnauld and Nicole (1662) is published together with the grammar. The grammar also represents volume 41 of the *Works of Antoine Arnaud gent* (Paris, 1780). More recently, H.E. Brekle has published a critical edition (Stuttgart, 1966); the edition of 1845 has been reprinted with an historical introduction by A. Bailly (Slatkine, Geneva, 1968) and the 1830 edition with an introduction by M. Foucault (Paulet, Paris, 1969).

The authors

The authors, Antoine Arnauld (1612–94) and Claude Lancelot (1628–95) are both linked to the Jansenist movement, whose devotees lived at the Abbey of Port-Royal des Champs, near Paris. Antoine Arnauld, a theologian and logician, was one of the leaders of the movement and, with Nicole, wrote the logic. Lancelot, a scholar and teacher, master of several languages and author of handbooks for learners of Latin (1644), Greek (1655), Italian and Spanish (1660), was the chief architect of the transformations in teaching carried out over a twenty-year period

in Port-Royal's renowned 'Petites Écoles'. Although it is impossible to determine exactly the contribution of each author, it seems reasonable to assume that the knowledge of former doctrines and grammatical studies and mastery of languages came from Lancelot, and that Arnauld contributed his powerful intellect and his capacity for marshalling a mass of data.

The grammar and the logic

The grammar belongs to the rationalist current of thought already visible in the works of Scaliger (*De Causis linguae latinae*, 1540), Ramus (about 1560), Sanctius (*Minerva*, 1587), and Scioppius (*Grammatica philosophica*, 1628). It is deeply influenced by René Descartes (1596–1650). In its second edition, the grammar includes an address to the readers informing them of the publication of *The Logic or the Art of Thinking* by Arnauld and P. Nicole, a work 'based on the same principles' which 'can be extremely useful to explain and demonstrate several of the questions raised in the Grammar'. The logic, which underwent several successive changes until 1683, includes several chapters (vol. II, chapters 1 and 2) reproduced almost literally from the grammar. Other chapters study in detail problems that had been dealt with cursorily or simply alluded to in the grammar. It is necessary to compare the two works – the second one often casts further light on the ideas on language in the first work – bearing in mind, however, that the successive emendations may have altered the unity of the doctrine on certain questions.

The difference in purposes of the two works must also be taken into account. The grammar deals with only three of the four 'operations of the mind' considered as essential at the time – to conceive, to judge, to reason and to order – stating that 'All philosophers teach that there are three operations of the mind: to conceive, to judge, to reason' (vol. II, p. 1). Although the authors acknowledge that 'exercising our will can be considered as one mode of thinking' distinct from simple affirmation, they study it only in connection with the different ways of expressing it – optative, potential, imperative forms – in the chapter on verbal modes (vol. II, p. 6). The logic shows even more reticence as it avoids any allusion to the expression of the will. Out of the three remaining operations, the grammar leaves out the third one, reasoning, as being only 'an extension of the second one': 'To reason is to make use of two judgements to form a third' (vol. II, p. 1). Therefore, reasoning is studied in the logic, which returns to the ideas developed in the grammar merely to deal, in the third and fourth parts, with different ways of reasoning and the methods that enable one to judge correctly and to reach the truth. The chapters of the logic that deal, more exhaustively, with compound propositions are not a mere complement to the grammar, even though they seem to be so, but a study of reasoning, whose aim, as the examples analysed show, is apologetic and which should be situated in the context of the doctrinal conflicts and the metaphysical controversies in which the 'Messieurs' of Port-Royal were involved. As many commentators have pointed out (see, for instance, Chevalier 1968; Donzé 1971), the grammar, limiting its study to the problems of conceiving and judging, is a grammar of the single proposition. It lays down very firmly the simple sentence as the central linguistic unit of discourse. This idea influenced grammarians for more than two centuries.

Contents

The grammar is composed of two parts. The first part, comprising six chapters, deals with words as sounds and with the graphic signs that serve to describe them. The second, which is more developed, deals, in twenty-four chapters, with 'the principles and reasons on which the diverse forms of the meaning of words are based'. The general plan follows the traditional pattern in studying successively spelling (vol. I, chapters 1–2), prosody (vol. I, chapters 3–4), analogy (vol. II, chapters 2–23) and syntax (vol. II, chapter 24). The original feature of the grammar is a new distribution of the parts of speech and a justification of the procedure in a central chapter (vol. II, chapter 1) that expounds the underlying principles of the plan followed. The second part studies in succession 'nouns, substantives and adjectives', including numbers, genders and cases (chapters 2–6), articles (chapter 7), pronouns (chapter 8), especially relatives (chapters 9–10), prepositions (chapter 11), adverbs (chapter 12), verbs (chapter 13), together with

the problems of person and number (chapter 14), tense (chapter 15), mood (chapter 16), infinitive (chapter 17), 'adjectival verbs' (chapter 18), impersonal verbs (chapter 19), participles (chapter 20), gerunds and supines (chapter 21), the auxiliary verbs in non-classical languages (chapter 22). Chapter 23 deals with conjunctions and interjections; the last chapter (24) deals with syntax from the double point of view of agreement and word order.

This plan, which may surprise the modern reader, is very coherent when we consider its underlying principles, which illuminate the authors' methods and their claim to have written a general and reasoned grammar. It seems that this was the first time a grammar had put forward such a claim. Unlike the grammars written by the Renaissance humanists, whose painstaking efforts to forge the description of modern languages from that of Latin remained for the main part centred on a morphological description, the grammar of Port-Royal was explicitly presented as applicable to all languages since it was based on an analysis of mental processes. Even though the authors started from an analysis of languages familiar to them – most of the examples being taken from Latin and French – their analysis was not based on morphology, but on the relationships between ideas and conceptual patterns on the one hand, and the words and discursive forms that serve to express them on the other. Beyond the diversity apparent in individual languages, they tried to find out 'the reasons for what all languages have in common, and for the main differences that can be found between them' (vol. II, p. 1). Their aim was to explain the fundamental and universal principles which formed 'the basis of the art of speech': 'The diversity of the words making up discourse' depends on (vol. II, p. 1) 'what goes on in our minds … we cannot understand correctly the different kinds of meaning contained in words unless we have first a clear notion of what goes on in our thoughts, since words were invented only in order to express thoughts'.

The theory of the sign

Thus the grammar stated again explicitly the theory of the word defined as a sign: 'one can define words as distinct articulated sounds that man has turned into signs in order to signify his thoughts' (vol. II, p. 1). Yet the concept of the sign, however fundamental, was not developed in the grammar; it was in the logic, and this only in 1684, that a general theory of the sign was sketched out (Log. I, 4):

> When we consider a certain object as a mere representation of another, the idea we form of this object is that of a sign, and this first object is called a sign. This is how we usually consider maps and pictures. Thus the sign contains two ideas, first the idea of the thing which represents, second the idea of the thing represented; and its nature consists in giving rise to the second idea through the first one.

What makes up the 'nature' of the sign is therefore as much the very representation involved in it as the power of representation that it possesses. It operates on the mind not only as a symbolic representation, but also as directly endowed with the power of representing. 'Between the sign and its content, there is no intermediate element, nor any opacity' (Foucault 1966: 80). Hence, the question of the meaning of the linguistic sign does not arise, and the grammar includes no theory of meaning or of the word as a meaningful unit. Sounds are used by human beings as symbols of the representations of things as given by the mind. On the other hand, they are the creation of human beings – **institutional signs** as opposed to natural signs. As such, even though their capacity of representation is due to the Almighty's power at work in human minds, they have no inherent compulsory characteristics. In this respect, the theory foreshadows Saussure's theory of the arbitrary relationship between signified and signifier [*see* INTRODUCTION].

The two kinds of signs

The original feature of the grammar is that it makes a distinction between two sorts of linguistic signs according to whether they signify the 'objects' of our thoughts or their 'form and manner'. The first sort included nouns, articles, pronouns, participles, prepositions and adverbs. The second sort corresponds to verbs, 'conjunctions' and interjections. 'Conjunctions' include

the particles that serve to express 'conjunctions, disjunctions and other similar operations'; that is to say coordinating conjunctions, *and*, *or*, *therefore*, the subordinating conjunction *if*, the Latin interrogative particle *ne* and the negative particle *non*. These two kinds of words correspond to the universal mental patterns underlying the production of discourse and made apparent in the two operations studied by the grammar: the conception of ideas and the bringing together of two conceived terms.

Conception is 'simply the way our minds look at things in a purely intellectual and abstract manner, as when I consider existence, duration, thought, or God, or with concrete images, as when I picture a square, a circle, a dog, a horse' (vol. II, p. 1), or it may be 'simply the view we have of the things that come across our minds' (log., Foreword). Notice that the grammar gives no definition of ideas, although this concept was at the heart of the controversies aroused by Descartes' philosophy, in which Arnauld took part. According to the logic, ideas are 'all that is present in our minds when we can say with certainty that we conceive a thing' (log. I, p. 1). Like Descartes, Arnauld identifies thought and conscience, as well as will and thought. Ideas must be understood as 'all that is conceived immediately by one's mind': notions, concepts, feelings: 'all the operations of will, understanding, imagination and the senses' (Descartes; see Dominicy 1984: 36).

To judge is 'to state that a thing that we conceive is thus, or is not thus: for instance, once I have conceived what the earth is and what roundness is, I state that the earth is round' (Gram. II, p. 1). Here again Arnauld was borrowing from Descartes who said that in judgement we should distinguish 'matter' and 'form' and therefore judgement should be seen as resulting from a joint operation of understanding and will. While the authors placed particular emphasis on judgement, they did not neglect the other forms or manners of thinking: 'one must also include conjunctions, disjunctions and other similar operations of our minds and all other movements of our souls like desires, commands, questions etc.' (vol. II, p. 1). However, judgement is the fundamental operation by which thinking usually takes place, for 'men seldom speak merely to express what they conceive, but nearly always to express the judgements they form about the things they conceive' (vol. II, p. 1).

The example given above became the canon of affirmation and proposition. For if the underlying structure of 'what goes on in our thinking' seems to be outside the field of grammar, the transition to the grammatical domain is achieved through an equation, presented as absolutely obvious, between judgement, i.e. affirmation, and the proposition (vol. II, p. 1):

> the judgement that we form of things, as for instance when I say, the earth is round, is a proposition; therefore, any proposition is necessarily made up of two terms: one is called the subject about which we make an affirmation: the earth; and the other called the attribute which is what we affirm: round, and in addition the link between the two terms: is.

The significance of the example chosen to illustrate the identification of judgement with its spoken or written expression must be clarified. It is an inclusive judgement whose enunciation entails non-explicit features, all of which are not equally important. It is not obligatory for the proposition to include only simple terms and a single affirmation, which would make it comparable to the basic sentence of generative grammar [*see* GENERATIVE GRAMMAR], as can be seen in Chapter 1, p. 9 of the logic that deals with the relative pronoun and 'incidental' clauses that we shall study below. The presence of the subject attribute and, as a corollary, of the linking copula *is* is, however, imperative. It is linked with the theory of the verb (vol. II, p. 13).

The verb

The grammar rejects the definition given by Aristotle, according to whom the verb signifies actions and passions – and this is no more than an interpretation of the attribute – and by Scaliger, according to whom the verb signifies what is passing, as opposed to the noun, which signifies what is permanent. Instead, the grammar defined the verb as 'a word whose main use is to signify affirmation, that is to say, to point out that the discourse in which this word is used is the discourse of a man who does not only

conceive things, but also judges and affirms them.' The phrase 'main use' helps to distinguish affirmation from 'other movements of the soul, like wishes, requests, commands, etc.' that can also be expressed by the verb, but only through a change of inflection and mode; that is to say, by introduction of supplementary marks. The verb can also include the idea of subject, for instance in the Latin utterance *sum homo*, '*I am human*', where *sum* does not only contain the affirmation, but also contains the meaning of the *ego*, 'I' pronoun. The idea of subject itself can be combined with that of attribute: *vivo* = *I am alive*. Moreover, the verb can include an 'indication of time'. But the person, number and time are only the 'principal incidentals' which are added to the verb's essential meaning.

There are two categories of verbs. The one archetypal verb, which marks affirmation and nothing else, is the verb *to be*: 'Only the verb to be, which is called substantival, has preserved this simple character', and even then 'it has preserved it only in the third person of the present tense, and in certain occurrences' (vol. II, p. 13). The other verbs, called 'adjectival verbs', contain, in addition to affirmation, the meaning of an attribute. *Petrus vivit*, *Peter lives* are equivalent to *Peter is alive*. Every verb can thus be reduced to a paraphrase which equates its participle to the adjectival attribute.

The idea of this paraphrase, presented as universally applicable, belonged to an old tradition in grammar. The paraphrase is not purely grammatical and very often it cannot be used in real discourse. It is halfway between logic and grammar, and it represents a form of logical relationship which can be formalised through a procedure of theoretical grammatical transformation. Thus, the notion of affirmation is organically linked with the verb which embodies at the same time 'the relationship that our minds set up between the two terms of a proposition'; that is to say, the inclusion of the idea of attribute within the idea of subject. Inclusion belongs to the logic of ideas. It is connected with the axiomatic conditions of categorical propositions and can be expounded in terms of comprehension and extension (Pariente 1985: 265). It appears that setting up a relationship also entails the acceptance of inclusion, 'the relationship that we set up in our minds', and this gives it an illocutionary [*see* SPEECH-ACT THEORY] character. It is in this respect that the verb differs (vol. II, p. 13) from those few nouns that also signify affirmation such as *affirmans*, *affirmatio*, because they signify it only in so far as it has become the object of our thinking, through a mental reflection, and thus they do not indicate that the person who makes use of these words is affirming, but only that he conceives an affirmation.

Simple and complex propositions

However, the definition of the proposition raises a number of problems when it comes to analysing more complex utterances than the minimal sentence used to illustrate it in the grammar. It is on this question that we find the most important changes in the successive editions of the grammar and the logic. Nowhere does the grammar really expound the concept of grammatical subordination and it deals with complex sentences only with reference to the relative pronoun (vol. II, p. 9), to the interpretation of the Latin *quod*, the French conjunction *que* (which is in fact connected with the relative) of the Latin infinitive proposition and indirect interrogative propositions introduced by *si* in French and *an* in Latin (vol. II, p. 17). The chapter devoted to the relative pronoun refers the reader back to the logic which deals with 'complex sentences'.

The 'simple proposition' includes only one judgement, and therefore only one subject and only one attribute: 'God is good'. When the utterance contains several subjects to which is applied a single attribute, or several attributes applied to one subject, the proposition is said to be 'compound' (Log. II, 5) for it contains several judgements: 'Life and death are within the power of language', 'Alexander was the most generous of Kings and the conqueror of Darius'. But the single subject or attribute can be expressed by a complex term and in this case the proposition may itself be either simple or complex, depending on the logical interpretation of the term used.

According to the grammar, when complexity is manifested by the 'union of two terms', one of which is governed by the other – as, for instance, when two substantives are linked by the preposition *of*, or, in English, the possessive case – 'this union of several terms in the subject and the

attribute is such that the proposition may nevertheless be considered as simple, as it contains only one judgement or affirmation': 'Achilles' valour was the cause of the fall of Troy'.

Complexity, on the other hand, can occur in the linking of a single subject or attribute with a term or syntagm which can be interpreted from a logical point of view as expressing a first judgement distinct from the global one expressed by the subject and attribute and, so to speak, included within the latter. This is what happens with propositions introduced by a relative pronoun (Log. II, 5):

> There are several propositions which have properly speaking only one subject and one attribute, but whose subject or attribute is a complex term, containing other propositions which we may call 'incidental' and which are only parts of the subject or the attribute, as they are linked by the relative pronoun who, which, whose function is to join several propositions, so that they together form one single proposition.

The grammar emphasised the innovative nature of its interpretation of the relative, according to which 'the proposition in which it appears (which may be called incidental) can belong to the subject or to the attribute of another proposition which may be called the main proposition' (vol. II, p. 9). It will be noticed that the term 'main' is applied to the whole, whereas subsequent practice applied the term differently. But the authors considered an adjectival term directly related to the noun as equivalent to an incidental proposition, so that the complex proposition may very well contain no incidental proposition expressed grammatically: 'these types of propositions whose subject or attribute are composed of several terms contain, in our minds at least, several judgements which can be turned into as many propositions'. Thus 'Invisible God created the visible world' is the equivalent of 'God, who is invisible, created the world, which is visible'.

It is this passage, among others, that Chomsky (1966: 34) interprets in terms of deep structure and surface structure to present the Port-Royal Grammar as a forerunner of transformational-generative grammar, a presentation which has been severely criticised by other writers (see, for instance, Pariente 1985: chapters 1 and 2). Therefore, it is the logical interpretation of the complex term which tells us whether it contains a judgement distinct from – and included in – the global judgement, and whether one can find several propositions in the 'main' proposition, which is also called 'whole' (Gr. II, 9) or 'total' (Log. II, 6). But the effect of the assimilation of judgement with proposition, 'this judgement is also called proposition' (Log. II, 3), is that the two terms are used sometimes to mean different things and sometimes to mean the same thing. The result is to produce some terminological uncertainty: 'When I say invisible God created the visible world, three judgements are formed in my mind, which are contained in this proposition … ' 'Now these propositions are often present in my mind, without being expressed in words' (Gram. II. 9). The logic (vol. II, p. 5) points out that incidental propositions 'are propositions only very imperfectly … or are not so much propositions that are made at the time as propositions that have been made before; as a consequence, all one does is to conceive them, as if they were merely ideas'.

The influence of the grammar

The theory of the sign, of the proposition and of the verb have been presented here as the most important parts in the grammar because of their decisive influence in the development of grammar and of the philosophy of language. In returning to a mentalistic viewpoint presented as universal and using theoretical tools at once powerful and simple, the Port-Royal grammar was the starting point of the current of thought in general grammar which was to prevail, with some changes, until the middle of the nineteenth century. The theoreticians of the eighteenth century developed their ideas in reference to it, very often to refute or modify particular aspects of it. But the grammar had a powerful influence in establishing the proposition as the central unit of grammatical study.

The fact that it was written in French, twenty-three years after Descartes' *Discours de la méthode*, also contributed to French being viewed as a language to be studied in the same way as

classical languages were studied, and as a language which could carry the weight of philosophical speculation, and whose clarity is derived from the 'natural order'. Finally, it was through its influence that the idea that a reasoned knowledge may facilitate language learning became widespread.

J. B.

Suggestions for further reading

Dominicy, M. (1984) *La Naissance de la grammaire moderne*, Brussels: Márdaga.
Donzé, R. (1971) *La Grammaire générale et raisonnée de Port Royal*, 2nd edn, Berne: A. Francke.
Pariente, J.C. (1985) *L'Analyse du langage à Port-Royal*, Paris: Editions Minuit.

Pragmatics

What is pragmatics?

Pragmatics, as a field distinct from **semantics**, has been difficult to define. Charles Morris (1938) gave the traditional characterisation, according to which semantics is the study of the relations between linguistic expressions and the world, relations such as denotation and truth, while pragmatics concerns linguistic expressions as they are used by speakers and writers to communicate. At the level of whole sentences, semantics attempts to give an account of **truth conditions** – a specification, for each sentence of the language, of what the world would have to be like for it to be true – and how such truth conditions are determined by the meanings of the component expressions in the sentence plus their syntactic composition. On the other hand pragmatics is concerned with aspects of meaning which arise in connection with contexts of utterance – including such parameters as speaker and addressee(s) as well as the time and place of utterance. (Examples will be given below.) Stalnaker (1974) contrasted Morris's characterisation of the semantics–pragmatics distinction with another, according to which semantics concerns what is conventional, or arbitrary, about linguistic meaning while pragmatics studies meanings that arise in conversation in a non-arbitrary way. The field is perhaps one of the broadest and most heterogeneous within linguistics, as can be seen from the topics which fall under it, a sampling of which are considered below.

Deixis/indexicality

As noted above, a goal of semantics is to give rules which specify truth conditions for sentences. However it is not possible to do this in full without making reference to language use because of the existence of **deictic**, or **indexical**, **expressions** – expressions like *you* and *yesterday*, whose denotation cannot be determined without some knowledge about aspects of the context of utterance. Any of the **parameters of context** mentioned above – the participants (speaker and addressee), and the time and place at which the utterance takes place – may figure in deictic expressions; hence the three main categories of **personal**, **temporal**, and **spatial deixis**. Some of the most obvious examples are personal pronouns (e.g., *I*, *you*, vs. *she*, *it*) and temporal and spatial adverbials (*now*, *soon*, *day after tomorrow*, *here*, *on the other side of the tree*). Tense marking (e.g., *She will leave* vs. *She has left*) affects the interpretation of all sentences of English.

Deictic elements may show up in ordinary vocabulary as well; the difference between *come* and *go*, in English, for example, involves whether the motion described is toward the speaker (or in some cases the addressee). Similarly, determining the reference of a word like *local* in an example like (1):

(1) The local authorities have been contacted.

may require knowledge of the place of the utterance (see Fillmore 1997; Nunberg 1993).

In addition to personal, temporal, and spatial deixis, some researchers identify a subcategory of **discourse deixis**, e.g., for uses of expressions like *former* and *latter* to identify spots in a preceding text (see, e.g., Webber 1988). Some spatially deictic expressions may also be anchored textually, as in (2).

(2) *Los Angeles* Betty Springer's neighbours discovered her body at 1am this morning. The local authorities were contacted …

A fifth subcategory of **social deixis** has been identified, for cases where social identity is relevant for linguistic choices, such as the difference between *tu* and *vous* (both 'you') in French – the former being used between friends and family members while the latter is suitable for more formal circumstances.

The existence of indexicality prompted Kaplan (1977) to propose a distinction in levels of meaning between **character**, the linguistically encoded semantic properties of an expression, and **content**, the contribution which an expression makes to the propositions expressed by utterances in which it occurs. Using this distinction he was able to explain the peculiar status of a sentence like (3).

(3) I am here now.

In one sense (3) seems to express a necessary truth – its character is such that any time it is uttered it expresses something true in that context. However the propositional content expressed on any such occasion is contingent – the fact, for example, that I am in the town of Lake Leelanau, Michigan at 9:30 a.m. on 22 October 2007 is a contingent one. I could easily have been elsewhere at this time.

Presuppositions

Perhaps none of the subfields within pragmatics illustrates its complex borderline character as much as the topic of presuppositions. This topic arose in connection with a dispute in philosophy of language, over whether **reference** is a semantic relation holding between noun phrases (NPs) and what they denote in the world, or a pragmatic relation – something speakers use NPs to achieve. Bertrand Russell (1905) gave an important semantic analysis of **definite descriptions** – NPs which in English begin with the determiner *the*. Russell analysed the NP *the King of France*, as it occurs in example (4), as consisting of the three parts paraphrased in (5).

(4) The King of France is bald.
(5) a. There is at least one king of France.
    b. There is at most one king of France.
    c. He [i.e. the one and only one King of France] is bald.

Strawson (1950) raised objections to this analysis. He argued (i) that it is important to distinguish the **sentence** *The King of France is bald* from any **utterance** of that sentence in order to make a **statement**, and (ii) that anyone using the sentence in (4) to make a statement would not be **asserting** that there is one and only one king (as Russell's analysis suggests) but instead would be **presupposing** that. Furthermore, (iii) given that France is currently a republic, anyone uttering (4) now would not be able to make either a true or a false statement using that sentence. Thus assertions of either (4) or its denial in (6):

(6) The King of France is not bald.

would result in a statement without a truth value. (This last claim is similar to one made earlier by Frege (1892); *see* PHILOSOPHY OF LANGUAGE). As linguists would come to describe the situation, use of a definite description **triggers** a presupposition, backgrounded relative to the main assertion in the utterance, to the effect that a unique referent for the NP exists.

Subsequently linguists discovered a number of other instances of presupposition triggers. Verbs of change of state, such as *stop*, *start* and *continue*, trigger a presupposition concerning a prior state; so, for example, to assert that Mary stopped (or didn't stop) subscribing to *Newsweek* presupposes that Mary has been subscribing to *Newsweek*. **Factive** predicates – such as *know*, *be happy that*, *be odd* – trigger a presupposition that their complement clause is true; *Bill is/isn't happy that today is Tuesday* presupposes that today is Tuesday (Kiparsky and Kiparsky 1970). It also became clear that presuppositions are shared not only by positive sentences and their negations, but also when sentences are embedded under modals (e.g., *The King of France might be/is possibly bald*), made into questions (*Did Mary stop subscribing to* Newsweek*?*), or embedded in the antecedent of a conditional sentence (*If Bill is happy that today is Tuesday*, *he must like his job*). The **projection problem** for presuppositions is to determine in a general way when presuppositions survive embedding (see Heim 1988).

It was the phenomenon of presupposition that prompted Stalnaker to point out the alternative characterisation of the semantics-pragmatics

divide mentioned above. He argued that presupposition failure should not be considered to result in lack of a truth value (*pace* Strawson and Frege), and hence that presuppositions are not semantic in that sense. Instead, presuppositions should be considered pragmatic in that they result from the natural arrangement of **given** vs. **new** information in an utterance (see 'Information Structure' below). Nevertheless there is a semantic aspect to presuppositions – it is because of the conventional meaning of the verb *stop*, for example, that it carries the presupposition that it does.

Conversational implicature

One of the most important concepts in pragmatics is due to H. Paul Grice, presented in his 1967 William James lectures, titled *Logic and Conversation*. (Unfortunately no part of these lectures was published until 1975, when the second lecture appeared by itself under the title 'Logic and Conversation'. It was republished together with a revised version of the remaining lectures in Grice 1989, which appeared posthumously.) In these lectures, Grice presented a theory of conversation whose goal was to account in a systematic way for certain perceived divergences between natural language expressions and corresponding logical particles. For example, utterance of a sentence like (7):

(7) Some of these bottles are green.

would ordinarily be taken to convey in addition that there are also bottles which are not green. However the existential quantifier (∃) of logic, which corresponds to the English determiner *some*, does not have this meaning. The translation of (7) into predicate logic [*see* FORMAL LOGIC AND MODAL LOGIC] is given in (8).

(8) $\exists x[\text{bottle}(x) \,\&\, \text{green}(x)]$

The logical form in (8) reads, roughly, 'There exists something which is a bottle and is green', and it is perfectly consistent with all of the bottles being green. Grice argued that the extra element conveyed by (7), the 'not all' part, does not belong to the conventional meaning of *some* but is instead a **conversational implicature**, and he gave a systematic account of how such implicatures arise.

Grice's account involved a theory of conversation according to which participants generally follow, and assume that each other are following, certain rules. These rules are summarised in (9), under the headings which Grice gave them (Grice 1989: 26f).

(9) a. **Quality**: Do not say that for which you lack adequate evidence, or what you believe to be false.
   b. **Quantity**: Do not give (i) too little, or (ii) too much information.
   c. **Relation**: Be relevant.
   d. **Manner**: Avoid obscurity and ambiguity; be brief and orderly.

Grice stressed that such rules are a natural consequence of cooperative behaviour, which he took conversation to be; the particular rules in (9) should ultimately follow from more general principles governing cooperative behaviour of all types – fixing cars and baking cakes as well as conversing.

Conversational implicatures are propositions which the speaker believes her addressee(s) will attribute to her in order to maintain their assumption that she is following the rules of conversation to the best of her ability. In the case of (7) above the reasoning would go as in (10).

(10) *The speaker has said that some of the bottles are green. I assume she is obeying the rules of conversation, in particular the first rule of Quantity, which requires her to give sufficient information. If she knew that all of the bottles were green, she would have said so, because it would have been more informative. Ergo I assume that, as far as she knows, not all of the bottles are green.*

Grice distinguished conversational implicatures from **conventional** implicatures. (The similarity in labelling has been a source of confusion.) Conventional implicatures, according to Grice, are like conversational implicatures in not being part of the truth conditional content of an utterance. However they are crucially different in being semantically encoded in the utterance. His most famous example involves the semantic content of *therefore*, as in his tongue-in-cheek example (11).

(11) He is an Englishman; he is, therefore, brave.

On Grice's account (11) would be true if the individual referred to were both English and brave. The part about bravery as a consequence of being English, which arises because of the meaning of *therefore*, is a conventional implicature of the utterance. Conventional implicatures are similar in some respects to presuppositions, except that the standard examples of presuppositions, such as those given in the preceding section, are entailed by the simple positive sentences that give rise to them whereas conventional implicatures, by Grice's definition, are not.

Conversational implicatures are distinguished from conventional implicatures (and other aspects of conventional meaning) by several characteristics, the most important of which are **cancellability** and **calculability**. The characteristic of cancellability means that conversational implicatures may disappear, either because of contextual factors or because the speaker directly denies them. This may be done without the threat of self-contradiction, as in e.g., (12):

(12) Some of these bottles are green – in fact all of them are!

On the other hand semantically encoded material may not be so cancelled. The characteristic of calculability refers to chains of reasoning like that sketched in (10), which start with the proposition expressed and, using the assumption that the speaker has been following the rules of conversation, arrive at the conclusion that the speaker must believe the implicature in question. It should be noted that Grice did not want to claim that participants in a conversation actually go through such chains of reasoning, but only that the fact that such chains may be constructed post hoc is evidence that the proposition in question is a conversational implicature. Such chains of reasoning would make no sense for conventionally encoded aspects of meaning, which are by their very nature arbitrary.

Although Grice's main goal in 'Logic and Conversation' was the relatively narrow one of showing that, as far as semantics goes, natural languages are more similar to the formal languages of logicians than was customarily assumed at the time, nevertheless his work has had very broad implications and applications, of which we will have space here to mention only a few. First of all, the conversational implicature illustrated in (7) has turned out to be just one example from a broad category of what have come to be called **scalar** implicatures, following Horn (1972). Horn has identified a number of cases of **implicational scales** – sequences of expressions such that substituting a weaker expression for a stronger one would result in a sentence entailed by the original. Thus the sequence < *all*, *some* > forms such a scale, because sentences of the form *All of the Fs are G* entail the corresponding sentences of the form *Some of the Fs are G*. In fact that scale is just part of a larger scale, given below in (13a), and followed by other examples of implicational scales.

(13) a. < *all*, *most*, *many*, *some*, *a few* >
b. < *outstanding*, *excellent*, *very good*, *good*, *OK* >
c. < *boiling*, *hot*, *warm* >
d. < *freezing*, *cold*, *cool* >
e. < *necessary*, *probable*, *possible* >
f. < *n*, … , *3*, *2*, *1* >

It can be verified that a sentence containing an item from one of these scales will entail the sentences obtained by substituting, for that item, a weaker one – i.e. one to the right of it. Then, in general, whenever one of these scalar items other than the strongest on its scale is used, we expect a conversational implicature to the effect that nothing stronger could be said, by the same type of reasoning as was illustrated above in (10). On this account, e.g., to say that a movie is good is to implicate that it is not excellent, much less outstanding, or to say that Bill has three children is to implicate that he has no more than that.

Implicatures can arise in connection with any of the rules of conversation. To use another of Grice's examples – if I am out of petrol and you tell me there is a petrol station around the corner, you implicate that for all you know it is open and has petrol to sell. Otherwise your utterance would not be relevant. Or if I say *Sue completed the abstract and went to lunch* I implicate, by the Manner rule about being orderly, that she carried out those activities in the order mentioned. Notice that in these cases the addressee can infer additional positive information about the situations referred to, unlike the

case with the negative, upper-bounding scalar implicatures arising in connection with the first rule of Quantity.

All of the examples we have seen so far are of **generalised** conversational implicatures – those which would arise in most contexts. However, Grice also pointed out examples of **particularised** conversational implicatures, which depend not only on the utterance plus the assumption that the speaker is obeying the rules of conversation, but also on particular features of the context. Thus if I ask whether Tom will be at the meeting and you say *His car broke down*, you implicate that for all you know he won't be there. However in a different context your utterance would not imply anything about Tom being at a meeting. Finally, Grice argued that metaphors and other figures of speech involve flagrant violations of the rules of Quality – violations which addressees are intended to notice, and be spurred to seek a plausibly true implicature. *Ralph is so brilliant* would convey a particularised implicature that Ralph is quite dim in a context where Ralph has just committed a major blunder.

Subsequent work has sought to amend Grice's theory. The **relevance theory** of Sperber and Wilson (1986) proposes that relevance is the only principle required to account for the communication of information additional to what is linguistically encoded in an utterance, where 'relevance' is defined in terms of the quantity of new information implicated by an utterance in context, balanced by the effort involved in inferring this information. Within the framework of relevance theory, Wilson and Carston (2006) have offered their own account of metaphor and other figures of speech.

On the other hand Horn (1984) and Levinson (2000) have stayed closer to Grice's approach, but revised his rules. Horn's **Q principle**, which combines the first rule of Quantity with the first two rules of Manner, assures addressees that speakers have included sufficient information; his **R principle**, which combines the second rule of Quantity plus Relevance and the remaining Manner rules, is a speaker-oriented principle of least effort. Levinson proposes two interpretational rules similar to Horn's (his **Q-** and **I-heuristics**), plus an additional **M-heuristic**, which suggests inferring a non-stereotypical situation when atypical expressions are used. If I say *Louise caused the mouse's death*, for example, you may infer that the killing was indirect. This kind of **'neo-Gricean' approach** has been useful in explaining lexical gaps like the absence of *nand* ('not both') (Horn 1989), as well as semantic change over time (see Traugott and Dasher 2005).

Politeness

In giving his rules of conversation, Grice acknowledged the existence of other types of rules, specifically mentioning rules of politeness. Perhaps the most widely known theory of politeness is that of Brown and Levinson (1987; but see also Leech 1983). The Brown and Levinson approach relies crucially on the notion of **face**, or one's public image. There are two sides to face in this approach: **positive face** reflects the desire to be well thought of in one's community, while **negative face** reflects the desire to be independent and autonomous. Politeness strategies are various means to preserve the two faces of interlocutors in the face of potentially **face-threatening acts**, such as asking someone for a favour of some kind. Positive politeness, e.g., as in a request like *Would you be a dear and hand me that spoon*, attends to the addressee's positive face, while negative politeness, as in *I hate to bother you, but could you hand me that spoon*, is attentive to the addressee's negative face. The universality of Brown and Levinson's principles has been questioned; some have claimed there are basic differences between Asian and European cultures, suggesting that in the east the desire for harmony and the good of the group outweighs the individualism which characterises Western societies (see, e.g., Gu 1990).

Speech acts

The field of pragmatics arose within British philosophy of language in part as a reaction to what was seen as excessive concentration on the formal languages of logic and a resulting neglect of the complexity of natural language. J.L. Austin's 1955 William James lectures, published after his death as *How to Do Things with Words*, brought ordinary language to the fore. He pointed out that when we are speaking, in addition to performing **locutionary acts** (acts of

producing speech sounds, and words and phrases of a language; acts of referring and predication), we also perform what Austin called **illocutionary acts** – acts such as making promises, predictions or declarations; giving warnings, orders, or advice; asking questions; making requests; and so forth. Illocutionary acts typically require saying something, yet are performed over and above the mere utterance itself. Contrast a language drill, where locutionary acts are performed without accompanying illocutions. Note too that a given sentence, say *The door is open*, may be used in the performance of a variety of different illocutionary acts – inviting someone to come in, making a request to have the door closed, etc.

Austin also contrasted illocutionary acts with **perlocutionary acts** – acts of having an effect on your addressee in virtue of your utterance. Associated with any illocutionary act there are typically desired perlocutionary effects: one who makes a request would like their addressee to fulfil it, one who makes a statement would like their addressee to believe it. Nevertheless we can distinguish the illocutionary act performed in an utterance from any perlocutionary acts performed in that utterance, which may or may not be the desired ones.

Austin proposed to analyse illocutionary acts in terms of their requirements for successful performance, or **felicity conditions** as they are sometimes called. Thus a satisfactory promise should involve some future activity of the speaker, and one which the speaker is both able to perform and feels is in the best interests of the addressee. Furthermore a promise would be insincere if the speaker had no intention of carrying it out. By contrast a request or a directive involves a future action of the addressee, one which they are able to accomplish and which the speaker would like to have done. Austin's scheme of analysis has been revised and extended by Searle (1969). See also the quite different approach in Bach and Harnish (1979).

One area of particular interest is **indirect speech acts** – instances, which are very common, of speakers ostensibly performing one kind of illocutionary act but also intending to perform an additional illocutionary act which is in fact the main point of the utterance. Almost invariably, when you ask someone if they know what time it is (thus ostensibly simply asking a question about their knowledge state) they will take you to be making a request to tell you what the time is. Similarly a statement like *It's cold in here* will in many contexts be taken as a request to turn up the heat. Indeed, it is in the area of requests that indirect speech acts are most richly represented, probably because of a desire not to impose (see 'Politeness' above). Prototypical formulas for making indirect requests, such as *I would like you to*, or *Could you* are closely related to the felicity conditions for requests. A natural analysis would invoke Grice's concept of conversational implicature, and associated patterns of inference, to get from such utterances to their illocutionary targets. However, Sadock (1974) pointed out a certain degree of idiomaticity in indirect requests, most notably involving sentence internal *please*. Thus (14a) is natural while (14b) is not.

(14) a. Can you please pass the salt?
b. #Are you able to please pass the salt?

Morgan (1978) proposed that these types of technically indirect speech acts, which involve standard formulas such as that in (14a), should be regarded as conventions of usage, and coined the term 'short-circuited implicature' to describe them.

Information structure

Grice's first three categories of rules (Quality, Quantity, Relation) apply to the content of an utterance, while the fourth category (Manner) gives pointers for packaging this content. In fact there is much more going on in connection with the packaging of content than is suggested by Grice's Manner rules. A great deal of what is going on has to do with the status of the information encoded, and specifically the extent to which it is **given** (old) or **new**. **Information status**, or **cognitive status**, comes into play in the choice of referring expressions. There are many different types of NP which can be used to indicate a given referent: definite and indefinite descriptions (*the/a little yellow booklet*), proper names (*The Communist Manifesto*), demonstrative NPs (*this/that little yellow booklet*), pronouns (*this*, *it*). Gundel et al. (1993) organised these types of NP on a scale corresponding, roughly speaking,

to the degree of familiarity with the referent the addressee is presumed by the speaker to have (e.g., knowledge of the kind, ability to identify referent uniquely, prior acquaintance, referent currently at forefront of attention). Use of any expression requires that its minimal familiarity criterion be satisfied, and conversationally implicates that no stronger criteria are.

The categories of Gundel et al. lie within the presumed knowledge state of the addressee. Prince (1992) distinguished new and old information from the point of view of the addressee from new or old information from the perspective of the discourse. Being old to the discourse implies being hearer-old, but a referent might be familiar to an addressee but not yet mentioned. Using this distinction Prince examined syntactic subjects in a semi-formal text, and determined that there was a strong tendency for them to be discourse-old, and that the related tendency for them to be hearer-old was entirely accounted for by the discourse factor.

Just as a speaker has many options among NP types, so does she have many options for syntactic structure. Besides both active and passive sentence types, the existence of cleft and pseudo-cleft constructions and other structures allow for varied placement of sentence constituents (see Birner and Ward 1998), and prosodic structure adds another dimension to these possibilities (see Pierrehumbert and Hirschberg 1990). The sentences in (15) illustrate some of these possibilities – in the last example small caps indicate stress prominence.

(15) a. A delegation met the president.
b. The president was met by a delegation.
c. It was the president that the delegation met.
d. The person whom the delegation met was the president.
e. There was a delegation to meet the president.
f. A DELEGATION met the president.

A major factor governing the appropriateness of one or another of such permutations has to do with the status of the parts of the proposition(s) the speaker wishes to express. It is customary to divide the information in an utterance into two parts. The **topic**, or **theme**, is that portion which identifies what the utterance is about, and is generally discourse-old, and hence given. (The concept of sentence topic, which is associated with a particular portion of a sentence, should be kept distinct from the somewhat vaguer concept of discourse topic.) The **focus**, or **comment**, or **rheme**, is the (typically new) information being predicated of the topic. (Some of these terms go back to the Prague School of linguists; see Firbas 1966. It should also be noted that there is a great deal of variation in usage of these and related terms; see Lambrecht 1994 and Gundel and Fretheim 2004 for clarifying discussion.) The clearest cases occur in response to questions, which identify a topic explicitly. Consider the mini discourse in (16).

(16) a. What is Sue doing?
b. She's making a HAT.

The main sentence stress in (16b) is contained by the focus constituent. Here Sue (the referent of *she*) is the topic, and the property expressed by *making a hat* is the focus. ([16b] could also serve in a response to the question *What is Sue making?*, in which case only the NP *a hat* would supply the focus.)

Generally speaking, the informational categories of topic and focus correspond to traditional grammatical categories, the grammatical **subject** specifying the topic and the **predicate** giving the focus. This is the case with the example given in (16). However, neither correlation is required. For one thing, we find examples of 'all-focus' utterances, which do not have a topic portion. Examples would be utterances of sentences like *It's raining*, or *Mary called me up yesterday*, as they occur at the beginning of a conversation or in response to a general question like *What happened?* And even if both topic and focus are present, they need not be associated with their canonical grammatical relations, as shown in the following examples (adapted from Gundel and Fretheim 2004: 177; *she*, in [17b'], is intended to be understood as coreferential with *Pat*).

(17) a. Who called?
b. PAT called.
b'. Pat said SHE called.

In both replies the predicate gives the topic, and the subject provides the focus. In addition, the

focus in (17b') (*she*) is neither hearer- nor discourse-new. Instead, what is new is the fact that this referent satisfies the open proposition *x called*.

Discourse pragmatics

All of the pragmatic areas discussed thus far are clearly relevant to the study of discourse, and may be crucially affected by discourse features. However there are some additional kinds of phenomena which are inherently discourse related and which cannot be investigated at the level of the single sentence or utterance. One of these is the category of **discourse markers**. These are expressions like *well*, *so*, *but*, *to continue*, whose function is to relate the current utterance with what has gone before. Although these expressions do not contribute to the truth conditional content of what is expressed in an utterance, nevertheless they may have a big influence on what inferences are invited, as can be seen by comparing (18a) and (18b) (from Blakemore 2002: 9).

(18) a. Anna is here. So Tom's got a meeting.
b. Anna is here. But Tom's got a meeting.

While (18a) suggests that Anna being here is the cause of Tom's meeting, or perhaps gives evidence about it, (18b) suggests some kind of conflict between the two eventualities – perhaps Tom was supposed to meet Anna. It might be thought that such particles should be regarded as conventional implicature triggers; however this type of analysis is rejected by both Bach (1999), who classifies at least some of these expressions as **utterance modifiers**, and Blakemore (2002), who gives an analysis within relevance theory.

However they are best analysed, discourse markers contribute to the **coherence** of a discourse. Of course any such contribution must be relative to the content of the utterances themselves that make up the discourse. A great deal of research has been devoted to determining what explains coherence from that perspective. Kehler (2002) has revived and modified a theory originally due to the eighteenth-century Scottish philosopher David Hume, which holds that there is a very small group of possible coherence relations that may hold between successive utterances. Kehler identifies just three categories. **Cause–effect** relations hold when an implication relation exists between the eventualities described by two adjacent utterances. Some examples are in (19).

(19) a. John stopped by the supermarket. He wanted to get some eggs.
b. John wanted to get some eggs, but he forgot to stop at the supermarket.

In (19a) the second mentioned eventuality is a cause of the first; in (19b) the first eventuality leads one to expect the contrary of the second. **Resemblance** relations are quite different, according to Kehler's theory, and impose constraints on how eventualities are described. In **parallel** examples, such as (20a), a similar relation is held to hold between different pairs of entities, which in **contrast** examples like (20b), opposing relations are predicated.

(20) a. Mary is anxious about the war, and Kim worries about global warming.
b. Mary is anxious about the war, but Kim is very relaxed about it.

Finally, **Contiguity** relations hold between successive utterances describing aspects of some single eventuality, as exemplified in (21).

(21) She opened the door. Outside stood an imposing figure.

Kehler argues that recognising which relation of discourse coherence is in play in a particular case can help explain puzzling syntactic discrepancies, such as that in (22).

(22) a. #How much can Bill drink, but eat only a small amount?
b. How much can Bill drink, and still stay sober?

The coherence relation in (21a) is parallel, which requires parallel syntactic structures – violated by the *how much* question, which affects the first clause only. On the other hand the coherence relation in (22b) is a cause–effect relation, which makes no such requirements on form of expression.

B. A.

Suggestions for further reading

Horn, L.R. and Ward, G. (eds) (2004) *The Handbook of Pragmatics*, Oxford: Blackwell.
Kadmon, N. (2001) *Formal Pragmatics: Semantics, Pragmatics, Presupposition, and Focus*. Oxford: Blackwell.
Levinson, S.C. (1983) *Pragmatics*, Cambridge: Cambridge University Press.

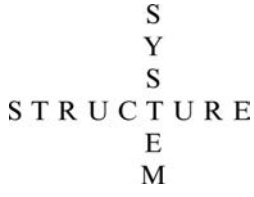
Prosodic phonology

Prosodic phonology, alternatively referred to as **prosodic analysis**, arose as a reaction against what proponents of prosodic phonology sometimes dub **phonemic phonology**, i.e. **phonemics** [*see* PHONEMICS], which operates with phonemes. In this sense as well as in certain other senses, prosodists' negative attitude extends also to functional phonology [*see* FUNCTIONAL PHONOLOGY]. Prosodic phonologists reject the notion of the phoneme altogether, asserting that the phoneme has no existence in a language itself and is merely one of the convenient categories to which some linguists resort in order to present the linguistic data they analyse. Prosodists' objection to the phoneme arises out of their belief that it has been developed for transcriptional purposes so that phoneme theory is closely associated with phonetic transcription and the devising of orthographies, rather than with serious phonological analysis.

Instead of operating with the phoneme, prosodic phonology operates with the **phonematic unit** – not to be confused with phonemes of any kind – and with **prosody**, terms which will be explained below. Prosodic analysis is also sometimes referred to as **Firthian phonology** or **London School phonology** because it originated with John Rupert Firth (1890–1960), Britain's first Professor of Linguistics, who taught at the University of London, especially at the School of Oriental and African Studies. Prosodic phonology was conceived by Firth in the mid-1930s and subsequently developed by him. Firth's followers have put his prosodic theory into practice in their phonological analyses of, mainly, Southeast Asian and African languages (see Palmer 1970).

Prosodic phonology is best characterised in terms of the concepts and entities which **prosodists** entertain and work with in their attempt to distinguish themselves as far as possible from '**phonemicists**'.

Prosodists operate with the notions of **system** and **structure**. The former relates to the concept of **paradigmatic relation**, and the latter to the concept of **syntagmatic relation**, two concepts commonly ascribed to the Swiss linguist Ferdinand de Saussure (1857–1913). Prosodists often use the following diagram to indicate the concepts of system and structure:



Linguistic units function in terms of the interaction between system and structure. In so far as linguistic units follow and precede one another, they form sequential syntagmatic structural relations with each other. Simultaneously, linguistic units also form paradigmatic relations with each other, since a linguistic unit is significantly, i.e. differentially, replaceable with another or others at that specific place in the structure, where all of the mutually replaceable linguistic units form a system [*see also* INTRODUCTION]. Prosodic phonology attaches primary importance to syntagmatic relation, and secondary importance to paradigmatic relation, and consequently highlights those phonetic features which are relevant to structure, i.e. prosody, which is a non-segmental unit. Prosodists are of the view that phonemicists attach excessive importance to paradigmatic relation at the expense of syntagmatic relation and are preoccupied with **segmentation**, which is consistent with their operating with phonemes.

Prosodists operate with different kinds of prosody. First, a prosody may be a phonetic feature specifiable by dint of its occurrence over a certain stretch of structure and consequently characterising the whole of such a structure. A **sentence prosody**, such as **intonation**, is one which occurs over the whole of a spoken sentence. The phonetic feature (**lip**-)**unroundedness**, which occurs over the whole of, for example, the English word *teeth*, and the phonetic feature (**lip**-)**roundedness**

which occurs over the whole of, for example, the English word *tooth*, are both **word prosodies**. A **tone** [*see* TONE LANGUAGES], which is a prosody that occurs over a single syllable, e.g. in the Mandarin Chinese word for 'mother', *ma*, is a **syllable prosody**.

Second, a prosody may be a phonetic feature occurring at a particular place in a structure, rather than over a certain stretch of a structure, but which has ultimate relevance to a certain stretch of the structure. For example, the phonetic feature **aspiration** (= a puff of air) in the pronunciation of a Tamil voiceless plosive consonant, e.g. [p^h], occurs in word-initial position only – the **focus of relevance** – never in word-medial or word-final position. Ultimately, however, its **domain of relevance** is the whole word in the sense that the aspiration characterises the pertinent word as a whole. In Czech, accent falls on the initial syllable of a polysyllabic word, at least in principle, and characterises the whole word, though its incidence is localised on the initial syllable.

Third, a prosody may be a phonetic feature which shows the demarcation between consecutive structures. Such a prosody is often referred to as a **junction prosody**. For example, aspiration accompanying a voiceless plosive consonant in Tamil, or accent on the initial syllable in Czech mentioned above, have additionally the function of indicating the demarcation between words. To give yet another example, the glottal plosive [ʔ] in German is a prosody which reveals the demarcation between morphemes in cases where morphemes begin with accented vowels, e.g. *wir haben ein Auto* [… ʔain ˈʔauto …]; *ich verachte ihm* [… fɛrˈʔaxtə …].

Fourth, a prosody may be a phonetic feature which is linked to, and which is therefore an exponent of, a grammatical or lexical category. Such a prosody is often referred to as a **diagnostic prosody**. For example, [z] in *rows* as in *rows of chairs* is a phonetic exponent of the grammatical category of number, plural in this case; this is not the case with [z] in *rose*. [ð] is a phonetic exponent of the lexical category of **deixis**, which encompasses that group of deictic or demonstrative words whose referents are things, persons, places, times, etc., including *this*, *those*, *there*, *then*, etc; this is not the case with [ð] in *gather* or *either*. This last-mentioned type of prosody is obviously different from the others in that, for one thing, it does not characterise any particular stretch of structure and, for another, it involves a non-phonological factor, namely grammar or lexis in these examples. Note, however, that the involvement of non-phonological levels is not only admitted but recommended in prosodic analysis because of its principles of polysystemicness and context, which will be explained further below.

In prosodic phonology, prosodists first abstract all the prosodies, starting with that prosody whose domain of relevance is the most extensive, i.e. intonation. However, it would seem perfectly valid to start with a prosody whose domain is even more extensive; that is, a prosody which characterises a whole speech. For example, nasality may characterise some people's speech throughout, while, in the case of speakers of a foreign language, elements from their own language may pervade their pronunciation of the foreign language. Abstraction of prosodies is carried on until there are no more phonetic features which characterise structures.

What remains when all the prosodies have been abstracted are the phonological units which prosodists call **phonematic units**. These are – unlike prosodies – **segmental**, hence linear, units, which are considered as being placed at particular points in the structure. A phonematic unit may be simply V (= vowel) or C (= consonant), or a phonetic feature like 'open' or 'close' if the phonematic unit happens to be vocalic.

To demonstrate how prosodic analysis is performed, we shall look at a few examples. Given the English word *tooth* [tuːθ], the prosodist abstracts the phonetic feature (lip-)roundedness which is manifested over the whole word: note that not only [uː] but also [t] and [θ] are rounded through assimilation [*see* ARTICULATORY PHONETICS] and this is precisely what the prosodist first wishes to abstract as a prosody. This prosody may be presented as **w prosody**, where 'w' refers to (lip-)roundedness. What remains are the phonematic units which the prosodist will present as **CVC** (consonant-vowel-consonant). The actual specification of a phonematic unit in terms of its phonetic components is neither important nor obligatory in prosodic phonology, so that it is not considered necessary to state

which CVC are in question. Given the English word *teeth* [tiːθ], the prosodist abstracts as a prosody the phonetic feature (lip-)unroundedness, which runs throughout this word, and presents this prosody as **y prosody**. What remains of this word after y prosody has been abstracted are the same phonematic units as we have seen above, i.e. CVC.

The prosodic analysis of the two English words *tooth* and *teeth* will be presented notationally as ^{w}CVC and ^{y}CVC, or $^{w}\overline{\text{CVC}}$ and $^{y}\overline{\text{CVC}}$. Note that the analysis did not start with segmentation, i.e. paradigmatically, into a series of phonemes, but with the abstraction of certain prosodies together with the identification of a structure, in this case a whole word, explicitly indicated by superimposed horizontal lines in one of the types of notation given above, the domain of relevance being words in these cases. Thus the two words in question, *tooth* and *teeth*, possess identical phonematic units, i.e. CVC, and differ from each other in that one of the words has w prosody and the other y prosody.

Another example of prosodic analysis that is frequently cited by prosodists is the following: Turkish possesses eight vowels which may be presented as: [i y e ø ɯ u a o]. These vowels may be represented in the following fashion:

[i y ɯ u]
[e ø a o]

Four prosodies, i.e. **front** (**f**), **back** (**b**), **rounded** (**r**) and **unrounded** (**u**), can be appropriately abstracted from these eight vowels. This leaves two phonematic units: a relatively high (i.e. close) vowel (**H**) and a relatively low (i.e. open) vowel (**L**). The result of the analysis can be shown as follows:

[i] = ^{fu}H	[y] = ^{fr}H	[ɯ] = ^{bu}H	[u] = ^{br}H
[e] = ^{fu}L	[ø] = ^{fr}L	[a] = ^{bu}L	[o] = ^{br}L

Given a few Turkish words as examples, e.g. *el* 'hand', *göz* 'eye', *bas* 'head' and *kol* 'arm', prosodic phonology will yield the following analysis (the corresponding phonemic analysis is added for comparison):

^{fu}Ll	^{fr}gLz	^{bu}bLs	^{br}kLl
(/el/	/gøz/	/bas/	/kol/)

It so happens that there occurs in Turkish what is called **vowel harmony**, whereby a given prosody which occurs in the initial syllable of a polysyllabic word prevails throughout the rest of the syllable(s), so that, for example, *elim* 'my hand' begins with [e] which, as has been seen above, possesses the prosodies of front (f) and unrounded (u), which prosodies also occur in [i] in the other syllable of this word. We shall see how *elim* 'my hand', *gözüm* 'my eye', *basim* 'my head' and *kolum* 'my arm' are analysed in prosodic phonology (the corresponding phonemic analysis will again be added for comparison):

^{fu}LlHm	^{fr}gLzHm	^{bu}bLsHm	^{br}kLlHm
(/elim/	/gøzym/	/basum/	/kolum/)

It will be seen that, in prosodic analysis, the Turkish morpheme denoting 'first person singular possessive', corresponding to *my* in English, is expressed in terms of an identical form, i.e. Hm, throughout, even though the initial vowel sounds in the above-cited Turkish words are different, i.e. [e ø a o], as reflected in the corresponding different vowel phonemes yielded in the phonemic analysis (/e ø a o/), hence the mutually different forms (/im ym ɯm um/) for the Turkish morpheme corresponding to the English word *my* in phonemic analysis.

Another characteristic of prosodic phonology is the **principle of polysystemicness**. This principle is intimately connected with the principle of context, as we shall see below. By **polysystemicness** – as opposed to **monosystemicness**, which prosodists attribute to phonemic phonology – is meant that units operating at a given place in a structure are independent of those operating at another given place in the structure; in other words, the sets of units operating in different places in the structure should not be identified with each other. This applies, prosodists emphasise, even to cases where a physically identical sound is found in different places in the structure. For example, in English, [m] occurring in word-initial position where there exists what Firth called an **alternance** between [m] and [n] – e.g. *mice*, *nice* – cannot be identified with [m] occurring in word-final position where there exists an alternance between [m], [n] and [ŋ] – e.g. *rum*, *run*, *rung*. Furthermore, [m] occurring in word-medial

position where there is also an alternance between [m], [n] and [ŋ] – e.g. *simmer*, *sinner*, *singer* – is not to be identified with [m] in word-final position any more than with [m] in word-initial position. It is evident that the contexts involved are different in terms of different places in the structure.

Actually, the principle of polysystemicness is further linked to that of context which, according to prosodists, operates at every linguistic level, including the phonological. This means that, to return to an example earlier adduced, [z] in *rows*, for example, which is an exponent of the grammatical category of number – plural, in this case – is considered to be a separate unit from [z] in, say, *rose*, which is not an exponent of this grammatical category. The two [z]s in question belong ultimately to different contexts in this sense, and should therefore not be identified with each other, though their phonetic context, i.e. word-final position, is the same. Moreover, [z] of *rows*, the verb, as in *he rows a boat*, which denotes third person singular present indicative, is not to be identified with [z] of *rows*, the noun. [ð] in *this* and [ð] in *father* are similarly non-identical. To give yet another example, none of the sounds in *display*, the noun, are to be identified with any of the sounds in *display*, the verb, even if a given sound in the former is physically identical with its corresponding sound in the latter: the two words are associated with different grammatical categories, i.e. noun and verb, and are consequently considered to occur in different contexts and should not be identified with each other.

It follows that the concept of **place** in prosodic phonology should be understood not narrowly in the sense of a place in a physically (i.e. phonetically) identifiable structure, but broadly in the sense that a place is associated with a particular system, the structure in question being phonetic or grammatical or syntactic or morphological or lexical or whatever, as the case may be. The implication of all this is that prosodists are first and foremost interested in seeking out **meanings** which they believe permeate through all domains of a language. In prosodic phonology, an attempt is made to identify meanings ascribable to sounds in a speech chain: this, in prosodists' view, justifies ascribing a meaning directly to a sound itself (cf. [z] in *rows* as a noun or as a verb).

The principle of polysystemicness and that of context inevitably multiply the units identified in different places in structures, or contexts, but without alarming prosodists. They believe that this multiplication is justified in prosodic phonology so long as phonological analysis is carried out according to principles compatible with prosodic phonology. The oft-quoted dictum, attributable to Antoine Meillet (1866–1936), a French disciple of Saussure, that '*une langue est un système où tout se tient*' ('a language is a system in which everything holds together'), is irrelevant and unacceptable to prosodists because this conception of a language would be associated with the principle of monosystemicness to which prosodists are opposed. To prosodists, a language is a group of disparate and isolated subsystems which do not come together in a single global system.

A few decades subsequent to the heyday of Firthian phonology, there emerged independently of it, in the mid-1970s, a few new types of **non-linear phonology** as off-shoots of classic generative phonology, such as **auto-segmental phonology** and **metrical phonology** as well as, a decade later, **prosodic phonology** (not to be confused with Firthian phonology; *see* GENERATIVE PHONOLOGY). All these are consistent with their rejection of the phoneme and segmentation and their acceptance of hierarchical multi-layers and prosodic units in their analysis.

T. A.

Suggestions for further reading

Palmer, F.R. (ed.) (1970) *Prosodic Analysis*, Oxford: Oxford University Press.

Robins, R.H. (1989) *General Linguistics: An Introductory Survey*, 4th edn, London: Longmans, §4.4.3, 'Prosodic Phonology'.

Psycholinguistics

Psycholinguistics is a discipline in which the insights of linguistics and psychology are brought to bear on the study of the cognitive aspects of language understanding and production. One of the earliest psychological accounts of language was Wundt's *Die Sprache* (1900), which is essentially a

psychological interpretation of the linguistic work of the Junggrammatiker [*see* HISTORICAL LINGUISTICS]. However, the strongly empiricist and anti-mentalist attitude to science which dominated both linguistics and psychology during the first half of the twentieth century [*see* BEHAVIOURIST LINGUISTICS] inhibited theorising about mental processes involved in linguistic behaviour, and it was not until the late 1950s and early 1960s that the work of Noam Chomsky [*see* GENERATIVE GRAMMAR] provided a climate of thought in which the discipline could flourish.

The main impetus for psycholinguistic research in the 1960s was the wish to explore the **psychological reality** of grammars produced by linguists, that is, to try to show that these in some way mirrored what went on in speakers' and hearers' minds. The two most famous controversies within this framework were produced by the **derivational theory of complexity** (DTC), according to which a sentence would be more difficult to process the further removed its surface structure was from its deep structure, and the theory of the **autonomy of syntactic processing**, according to which the syntactic analysis of sentences constitutes an independent stage in their perception. There is now general agreement that DTC is false (Garnham 1985: 71–4) and the grammars which produced it have, in any case, been superseded [*see* GENERATIVE GRAMMAR].

There has also been a general shift within psycholinguistics during the 1970s and 1980s away from models which take grammar as their starting point towards more psychologically based models. The question of whether syntactic processing is carried out independently of, or is interrelated with, other processes has not been decisively answered. It is an aspect of a more general disagreement about whether language is processed in a series of autonomous stages by autonomous components unaffected by each other, or whether there is interaction between levels of processing. The latter view became the more popular during the 1980s.

According to Clark and Clark (1977), psycholinguistics includes the study of children's acquisition of language. Many linguists would agree that both first and other language learning and also linguistic disabilities are the province of psycholinguistics (though see Garnham 1985, Preface, according to whom they are specialist areas, rather than central topics for psycholinguistics). In this volume, language acquisition and linguistic disabilities are treated in articles of their own [*see* APHASIA; LANGUAGE ACQUISITION; LANGUAGE PATHOLOGY AND NEUROLINGUISTICS]. Artificial intelligence may also be regarded as an area of psycholinguistics, but this topic is dealt with in this volume in the article, FROM COMPUTATIONAL LINGUISTICS TO NATURAL LANGUAGE ENGINEERING. The psycholinguistic research that will be reviewed here falls within the study of language from the perspective of cognitive psychology.

The cognitive approach

Three main questions lie at the heart of psycholinguistic research within the cognitive tradition:

1. What mental representations are retrieved and created in the course of language processing, and what is their structure? This is the point of closest contact between cognitive psychology and linguistics. However, since as mentioned above, early research failed to verify the psychological reality of transformational grammar, rather little research has directly addressed this question.
2. What are the processes, or algorithms, by which one representation is transformed into another. Progress on this question has been largely confined to lower levels of processing, such as word recognition and word production, and has been dominated by interactive activation (McClelland and Rumelhart 1981) and Connectionist models (McClelland and Rumelhart 1986).
3. What is the overall processing architecture? According to the **modularity hypothesis** (Fodor 1983; Forster 1979) different aspects of language processing, such as word recognition and syntax, are encapsulated in distinct modules. 'First pass' processing of the input proceeds in a serial, bottom-up, fashion; each module takes as input the output of the preceding module. Modules do not have access to information outside of their domain of operations (e.g., the syntactic processing module has no access to semantic information). In contrast, according to the

interactionist position (McClelland 1987), whilst there might be distinct representational domains (e.g., of phonological and orthographic word forms, syntax, semantics) these all interact with each other during processing. Processing occurs in 'cascade', such that higher levels of processing can influence lower levels, even before processing at the lower levels is complete.

Where possible, these aspects of the cognitive research agenda will be individually addressed in each of the core areas of psycholinguistic research covered here: visual and spoken word recognition, reading and phonology, accessing meaning, syntactic processing, general comprehension processes, and language production.

Visual and spoken word recognition

'Word recognition' refers to a process of perceptual categorisation whereby input is matched to a known word form in memory. Different representations are assumed to be contacted by written and spoken input (referred to as written and spoken input **logogens** by Morton 1979). Once such a representation has been contacted, it can then be used to access more information about the word, namely its pronunciation or spelling, or its semantic and syntactic properties. Before considering these aspects of what is sometimes referred to as 'lexical access', research on word recognition as such will be discussed.

Processing (parallel processing, interactive activation and competition)

A basic principle underlying models of word recognition since Morton's **logogen model of word recognition** (Morton 1969), is that an input pattern simultaneously activates multiple lexical representations according to their degree of match with the input (although serial search models do not make this assumption, Becker 1979; Forster 1976). McClelland and Rumelhart (1981) proposed a model of word recognition which adopted this idea and made additional assumptions about how simultaneously active representations compete and interact. Their model was an early example of the class of 'interactive activation' models which have come to be highly influential in many areas of psycholinguistics, and which could be regarded as the forerunners of **neural network**, or **connectionist**, **models**.

McClelland and Rumelhart's (1981) model assumes three levels of representation: visual features, letters and words (these representational assumptions are not critical since it is the nature of the way they interact in processing which is crucial for present purposes). Activation of units at each level is determined by the degree of activation they receive from the bottom up (i.e. their degree of match to the units active at the preceding level, and ultimately the input) and also from the top down (since units pass activation down to units at the preceding level that are compatible with them). Crucially, processing at any one level does not have to be complete before higher level representations can become active. Combined with the assumption of top down activation, the result is what is often referred to as 'cascade' processing. Another important aspect of these kinds of models is that processing within levels is 'competitive' because units at the same level represent mutually exclusive hypotheses. McClelland and Rumelhart formalised this model mathematically, and were able to successfully simulate data from experiments on humans, such as the 'word superiority' effect on letter perception (letters are easier to perceive in words, and even pronounceable nonwords like *glemp*, than in consonant strings). More recently, Johnson and Pugh (1994) tested one counter-intuitive prediction of interactive activation models: the more similar a word is to other words, the harder it will be to recognise since the less visually distinctive a word is, the greater the competition between word-level hypotheses. Johnson and Pugh (1994) confirmed this prediction, and interpreted the results within a more detailed model of visual word recognition than McClelland and Rumelhart's, but one which followed broadly similar principles. However, whether orthographic similarity to other words has inhibitory or facilitatory effects may depend upon task demands (Balota et al. 2006: 317–19).

Spoken word recognition also involves parallel activation and competition between multiple hypotheses. For example, the more phonetically similar a word is to other words, the harder it is to recognise (Luce et al. 1990). Gaskell and

Marslen-Wilson (2002) demonstrated that competitors even activate semantic information before they are ruled out by bottom-up information. The **TRACE model** (McClelland and Elman 1986) postulates feature, phoneme and word level units that interact in a similar fashion to the feature, letter, and word units in the McClelland and Rumelhart (1981) model of visual word recognition. Models such as Shortlist (Norris 1994), and the **COHORT model** (Gaskell and Marslen-Wilson 2002; Marslen-Wilson 1987, 1989) make different representational and architectural assumptions (see below) and yet all stress the competitive nature of spoken word recognition. It has also been demonstrated that spoken words are recognised not at their acoustic offset but at the point that the available acoustic information makes them unique relative to their competitors (Marslen-Wilson 1989). However, although early recognition of spoken words may very well be possible in principle, it may be difficult in practice. This is because statistical analyses of the English lexicon show that 84 per cent of polysyllabic words in English contain at least one embedded word, e.g., *hamster* contains *ham* (McQueen et al. 1995). Furthermore, in continuous speech there can be considerable ambiguity across word boundaries, e.g., *shipping* in *ship inquiry*. All of the above models solve these problems through competition, since lexical hypotheses that are activated by the same input segments are mutually incompatible and compete with each other.

Architecture (modular or interactive?)

In the case of visual and spoken word recognition, the debate between modular and interactionist positions has centred on whether there are direct influences of higher on lower levels of representation. For example, the fact that letters are easier to perceive in pronounceable nonwords than consonant strings would seem to require that competing word-level hypotheses (which are more numerous for a pronounceable non-word than a consonant string) activate from the top down the letters that they expect to be present in the input, making those letters easier to perceive (McClelland and Rumelhart 1981). Likewise there is considerable evidence for lexical effects upon phoneme perception (Ganong 1980; Marslen-Wilson and Welsh 1978; Samuel 1997), compensation for coarticulation (Elman and McClelland 1988; Magnuson et al. 2003) and even on the process of learning to adapt to an unfamiliar accent (Norris et al. 2003). However, there has been a debate over whether such effects truly reflect top-down activation from the lexicon, or whether they can be accounted for in modular models, such as Shortlist (Norris 1994) that only allow bottom-up activation from prelexical to lexical levels (Magnuson 2003; Pitt and McQueen 1988; Samuel and Pitt 2003).

Can semantic information influence word recognition? The interactionist position predicts that it should, because semantic context provides just another source of top-down activation which then percolates down to lower levels. According to the modular position it cannot because semantic information can have no effect on the operation of the word recognition module. There is evidence that visual word recognition is influenced by meaning-level factors. For example, words that are highly polysemous, i.e. that have many inter-related meanings, tend to be recognised more easily than words that are not (Rodd et al. 2002; see Balota et al. 2006: 319–23 for a summary of other meaning-related effects). This implies that a word's meaning is activated even before it is recognised; that is, when it is just one of many competing hypotheses, supporting the notion of cascading top-down activation in the interactive activation framework.

There is considerable evidence that words are easier to recognise when they occur in a semantically related context. In semantic priming tasks, recognition of one word is facilitated by prior presentation of a semantically related word (e.g., *cat* facilitates recognition of *dog*). But there has been debate over whether these effects are actually due to facilitation of the word recognition process itself, as opposed to other processes that contribute to task performance (Neely 1991). Semantic context effects tend to be very weak or entirely absent when tasks are used which might be assumed to tap recognition most directly, e.g., speeded word reading (Forster 1981; Hodgson 1991; Lupker 1984), supporting a modular view, but are larger when the word is made more difficult to read (Williams 1996), or at low levels of reading ability which suggests interactive processing (see Stanovich 1990 for a review). However,

from the modularist perspective, effects of 'semantic' context can be attributed to direct associative/collocational connections between lexical entries, and hence do not violate the assumption that semantic information influences recognition. In view of this, some research has attempted to distinguish truly semantic and associative/collocational context effects, although the two sources of relatedness are hard to distinguish (see Lucas 2000 and Hutchison 2003 for reviews). Other research has examined whether sentence context facilitates word recognition. Eye movement studies of sentence processing have shown that words that are predictable are fixated for less time, and indeed are more likely to not be fixated at all, than less predictable words (e.g., Rayner and Well 1996) indicating an effect of sentence context on even the early stages of word recognition (see Morris 2006 for review). Semantic context effects have also been demonstrated in spoken word recognition although accounts of this effect differ in the Cohort and Trace models (see Marslen-Wilson 1989, for a review).

Representation (phonemes, syllables, morphemes)

There has been debate over what kind of prelexical, and indeed lexical, representation is required to model speech recognition most effectively. Shortlist (Norris 1994) makes the simplifying assumption that the input is already categorised as phonemes, whereas Trace (McClelland and Elman 1986) initially encodes the input as acoustic-phonetic features that map onto phonemic representations. But what is clear is that sub-phonemic information is used by the recognition process. Sensitivity to co-articulation effects is evident in people's ability to predict upcoming phonemes (Warren and Marslen-Wilson 1987, 1988), and misleading coarticulatory cues impair recognition (Marslen-Wilson and Warren 1994). Sub-phonemic cues such as vowel duration can help solve the embedding problem (for instance by distinguishing the vowel in *ham* from that in *hamster*, Salverda et al. 2003). Sensitivity to phonetic detail is displayed in people's episodic memory for fine-grained voice information. For example, Goldinger (1996) showed that words that are repeated in the same voice are recognised more easily than words repeated in a different voice, even when there is as much as a one-week delay between presentations. Such findings blur the distinction between episodic memory and the lexicon, posing a challenge to the traditional view that episodic information is distinct from the recognition process (see Goldinger 1998 for an alternative exemplar-based theory of spoken word recognition).

Other researchers have argued that in order to ease the problem of segmenting continuous speech into words the lexical access process may utilise units of representation that are larger than the phoneme. Mehler et al. (1981) proposed that French listeners segment the input into syllables prior to lexical access. However, Cutler and colleagues have argued that English listeners utilise full quality strong syllables (see Cutler 1989, for a review). If segmentation strategies are language-specific then it becomes interesting to consider the case of bilinguals, an issue explored in Cutler et al. (1992).

With regard to morphology, there is clearly a tension between listing complex forms as unique lexical entries (i.e. disregarding morphology in the process of lexical access), and decomposing words into their constituent morphemes. While the former might seem necessary for opaque derivations and compounds (e.g., *restrain*, *butterfly*) and irregularly inflected forms (e.g., *went* as the past tense of *go*), the latter might be an economical means of dealing with inflections, transparent derivations and compounds (e.g., *walked*, *misjudge*, *space-walk*). Some models favour a dynamic interaction between these two kinds of representation, very much in the spirit of interactive activation models (Caramazza et al. 1988; Taft 1994). There is also evidence that visually presented words are segmented into potential morphemic units, even if these have no corresponding semantics. For example, *submit* is segmented into the units *sub+mit*, and hence primes *permit* (Forster and Azuma 2000), and *corner* is segmented into *corn+er*, and hence primes *corn* (Rastle et al. 2000). As Forster and Azuma (2000) argue, the crucial point in these cases is that both parts of the word are units that occur in other words, regardless of whether they make a contribution to meaning (hence *relish* would not be predicted to prime *polish* because *po-* is not a unit in other words). However, these are

essentially perceptual effects since they only occur at an early stage of visual processing. They do not reflect the underlying structure of lexical entries. In order to reveal the structure of modality-independent lexical entries Marslen-Wilson et al. (1994) investigated morphological priming effects when the prime and target were in different modalities (auditory primes and visual targets). They found priming effects only for transparent derivations such as *rebuild–build* and *happiness–happy*, and not *apartment–apart* or *release–lease*, supporting a traditional dual-system view in which morphological decomposition occurs for regular and transparent forms whilst irregular and opaque forms are stored as whole units in the lexicon.

The dual-system view has come under strong attack in the domain of inflectional morphology, particularly in relation to the English past tense. Rumelhart and McClelland (1986) developed a single-system connectionist model which learned to transform phonological representations of stem forms (e.g., *walk*, *go*) onto past tense forms (e.g., *walked*, *went*) simply by learning associations between stems and past tenses supplied in training (connectionist models have a neural network-like structure in which associations are stored in connections between elementary processing units, and learning associations are achieved through gradual modification of connection strengths). Over-generalisation errors like *goed* occurred during training. Such errors are normally regarded as indicative of rule learning, and yet no rules were represented in the system. Regular and irregular forms were stored in the same network, and rule-like behaviour was an emergent property of the system (see MacWhinney and Leinbach 1991, and Plunkett and Marchman 1991 for subsequent refinements to this approach).

However, this unitary system notion of morphology has been challenged by empirical findings of double dissociations between regular and irregular forms in processing tasks, and in language breakdown after brain damage (Pinker and Ullman 2002). On the other hand, when the contribution of semantics is taken into account, a natural division of labour between the processing of regular and irregular forms can spontaneously emerge even within a connectionist framework (Plaut 1997; McClelland and Patterson 2002). Others have argued that dissociations between regular and irregular English past tenses arise because of the demands regular forms make on a phonological parsing mechanism that decomposes them into stem and affix forms during processing (Marslen-Wilson and Tyler 1998). On this view, dissociations between the processing of regular and irregular forms reflect combinatorial processes of phonological assembly, and it would be unwise to generalise from the case of the past tense to make a general distinction between lexicon and grammar.

Reading and phonology

There has been a good deal of debate over the way in which phonology is derived from orthography, where as in the case of morphology dual-system and single-system approaches for handling regular and irregular forms have been proposed. There has also been debate over the role that phonology might play in accessing meaning and in general comprehension.

Representation (rules of pronunciation or lexical storage?)

There is good evidence to suggest that a distinction can be drawn between knowledge of the rules relating orthography and phonology (grapheme–phoneme conversion rules, Coltheart et al. 1993) and lexically represented pronunciation. Rules seem to be needed to account for the ability to read novel words whilst rote storage is necessary to read irregular words (echoing the tension between derivation by rule and lexical storage in morphology, see above). Some people suffering from acquired dyslexia (after brain damage) [*see* DYSLEXIA] are able to read novel words, but tend to produce regular pronunciations of irregular words. This so-called **'surface dyslexic' syndrome** (Coltheart et al. 1983) can be explained in terms of damage to the lexical system, and over-reliance on a rule system. In contrast, **'phonological dyslexics'** (Funnell 1983) and **'deep dyslexics'** (Marshall and Newcombe 1980) make errors reading novel words, but can read even irregular words correctly (deep dyslexics also make semantic errors, e.g., reading *dinner* as 'food'). These patients appear to have problems with the rule system

(and an additional problem accessing meaning in the case of deep dyslexics).

Processing (interactive activation, connectionism, the role of phonology in accessing meaning)

Even if one were to draw a representational distinction between lexical and rule-based routes to phonology there remains the issue of how distinct these are in processing terms. There is considerable evidence that in non-brain-damaged individuals, these two types of knowledge are in dynamic interaction. Glushko (1979) showed that pronouncing nonsense words is affected by whether there are competing lexical analogies (e.g., HEAF is relatively difficult to read aloud because of conflicting analogies with regular words like *leaf* and irregular words like *deaf*). This demonstrates an effect of lexically represented pronunciations on reading nonwords. Similar effects have been obtained for reading regular known words, for example *beard* is relatively difficult because of competition from irregular analogies such as *heard* (Jared et al. 1990; Jared 1997).

Coltheart et al. (2001) developed a dual-route cascade model to explain the interaction between lexical and rule-based systems in word reading. This uses an interactive activation framework that preserves the representational distinction between lexical storage of pronunciation and a grapheme-phoneme rule system, and successfully simulated the contrast between surface and phonological dyslexia. However, a more radical approach is to conflate lexical and rule knowledge within one representational system, and to see rule knowledge as an emergent property of lexical knowledge. Novel words are then read through an essentially analogical process, as suggested by Glushko (1979). This is an area where **connectionist**, or **neural network models**, have been relatively successful (Seidenberg and McClelland 1989; Plaut et al. 1996). The models are 'taught' the pronunciations of a sample of English words, varying in frequency and regularity. Their performance on 'reading' these words, and the pronunciations they produce for novel words, is then compared with human data. They demonstrate that it is possible for rule-like behaviour to emerge from a system which is only taught relationships between individual words and pronunciations. Furthermore, it is claimed that when 'damaged', these systems can simulate certain dyslexic syndromes (Plaut et al. 1996; Plaut 1997).

Another strand of research on phonological processing of written language has addressed the role of phonology in accessing meaning. On the one hand, it has been argued that visually presented words access meaning directly (Coltheart 1978), whilst other researchers have made the strong claim that visual words only access meaning via phonology (Van Orden et al. 1988; Lukatela and Turvey 1994; Van Orden and Goldinger 1994). It must be stressed that the latter view relates to the unconscious and automatic use of phonology, and not to the subjective experience of phonology in silent reading. Jared and Seidenberg (1991) provide evidence for a middle position in which high-frequency words are read directly, but phonology plays a role in reading low-frequency words.

Whereas arguments for the involvement of phonology in accessing meaning are plausible in the case of alphabetic writing systems, one might expect that in non-alphabetic writing systems there would be a direct pathway between visual form and meaning. However, Perfetti and Zhang (1995) found evidence for rapid activation of phonology even from Chinese characters, and on this basis argued for a universal phonological principle. On the other hand, Zhou and Marslen-Wilson (1999) showed that only when Chinese characters contain phonetic radicals does meaning access appear to be phonologically mediated. For characters containing no such radicals, meaning appeared to be activated directly from the visual form. Evidence for similar effects in Japanese Kanji is provided by Wydell et al. (1993).

With regard to phenomenally experienced phonology, there is general agreement that this is used as the means of storing verbal material in short-term memory (Baddeley 1990). However, whether this form of representation plays a role in language comprehension is not clear, since even patients with severely impaired phonological short-term memory can show unimpaired language comprehension. Gathercole and Baddeley (1993) suggest that only when sentences are long and syntactically complex

will phonological encoding contribute to the comprehension process.

Accessing meaning

Regardless of the route by which lexical representations of meaning are accessed, there remains the question of the form that those representations take (a representational issue), and how context influences what aspects of word meaning are activated (an architectural issue).

Architecture (homonyms and the modularity debate)

Homonyms have provided a popular testing ground for evaluating modular versus interactive processing architectures. Important evidence has come from cross-modal priming studies in which a participant hears a sentence containing an ambiguous word such as *bug*, and immediately at the word's offset a target word is visually presented for lexical decision. Semantic priming can be obtained for targets related to both of the word's meanings (e.g., *spy* and *insect*) regardless of any bias introduced by the sentence context. But if presentation of the target word is delayed slightly there is only priming from the contextually relevant meaning (Swinney 1979). Seidenberg et al. (1982) showed that this effect is particularly strong for noun–verb ambiguities such as *box*, and that selection of the appropriate meaning occurs within 0.2 seconds of the word's offset. These findings have been interpreted as strong support for a modular view of language processing (Fodor 1983; Pinker 1994). However, Tabossi (1988a) found that the subordinate (i.e. less frequent) meaning of a homonym does not become active in a strongly biasing irrelevant context, although it does in a more weakly biasing irrelevant context, whereas dominant meanings become active even in very strongly biasing irrelevant contexts (see also Rayner and Pacht 1994). With regard to accessing the subordinate meaning of an ambiguous word, eye movement studies have found that people spend longer reading an ambiguous word in a context that biases towards its subordinate meaning than an unambiguous control word, whereas this is not the case for contexts biased towards the dominant meaning – the 'subordinate bias effect' (Sereno et al. 2006, provide a recent example). The subordinate biased context appears to increase the activation of the subordinate meaning so that it competes for selection with the dominant meaning. Thus, meaning access is affected by meaning dominance and the strength of contextual bias, a view that is more consistent with an interactive than a modular processing architecture (see Morris 2006, for a review).

Representation (prototypes, context-dependence of features, category-specific impairments)

Early research on the representation of word meaning was concerned with prototype effects (see Aitchison 1987, for a review). It was discovered that people find it quite natural to make judgements about 'goodness' of category membership (for example they will judge that an apple is a 'better' fruit than a fig). It was argued that concepts like fruit cannot therefore be represented as a strict definition, but must instead be represented as a prototype which captures the central tendency, or family resemblance structure of the category (Rosch 1975; Smith and Medin 1981). However, Armstrong et al. (1983) found that people are also able to produce graded category membership judgements for concepts which are perfectly well defined, such as odd number or female. On this basis it seems more plausible to see prototype effects as a consequence of the way in which semantic information is accessed and used in a judgement task, rather than a direct reflection of underlying representations. Armstrong et al. (1983) drew a distinction between an 'identification function' and a 'conceptual core', where the former refers to a heuristic procedure used to make categorisations, and the latter to a core definition of the concept (see also Johnson-Laird 1987). According to Lakoff (1987b) prototype effects reflect underlying 'cognitive models' of a domain, and Barsalou (1985, 1987) argues that prototypicality judgements can be driven by 'ideals' which can be constructed on an ad hoc basis to form context-specific categories (e.g., foods to eat on a diet).

Some work on meaning access during sentence processing has attempted to distinguish different types of semantic information in terms of time

course of activation and context-dependency. There is evidence that contextually irrelevant associates of spoken words do not become active during sentence processing (Williams 1988; Tabossi 1988b; Norris et al. 2006). For example, Williams (1988) found that the auditory prime word *chair* facilitated lexical decisions on the target TABLE presented immediately at its offset when the prime occurred in a random word list, but not in a sentence that was irrelevant to the association, such as 'The man found that he could only reach the best apples by standing on a chair because they were all so high up', nor even in neutral sentence contexts such as 'It is often necessary for a chair to be used in order to reach things.' Norris et al. (2006) also failed to obtain priming of associates over a number of experiments (e.g., *cup* did not prime *saucer* in 'It was clear that the cup had attracted the attention of the antique dealer'). They only obtained an effect when the prime word received contrastive stress (e.g., 'She was allowed no more than a CUP of the soup'). These results suggest that words in sentences only activate associated concepts under special circumstances. The implication is that during sentence processing activation of associated concepts derives primarily from the contribution words make to the sentence interpretation (see Norris et al. 2006, for discussion).

With regard to properties of concepts, these have been distinguished in terms of dominance, or centrality (i.e. the ease with which they come to mind when people are asked to write down the features of a concept). It has been found that, in contrast to associates, central properties (e.g., 'music' for *piano*) are active regardless of the context, whereas in an irrelevant context peripheral properties (e.g., 'heavy' for *piano*) fail to become active at all (Greenspan 1986) or are rapidly suppressed (Whitney et al. 1985). Where these results differ from those obtained with homonyms is that the activation of central properties appears to persist even in seemingly irrelevant contexts. Barsalou (1982) distinguished context-dependent and context-independent properties, and found that the latter persist into the final interpretation of the sentence (e.g., the property of bank 'Where money is kept' is as available after reading *The bank was robbed by three bandits* as after reading *The bank had been built three years ago*). Williams (1992) extended this line of investigation to polysemous adjectives, finding that 'central' aspects of an adjective's meaning (e.g., *firm* as in 'solid' as opposed to 'strict') remain persistently active even in an irrelevant context.

Other work has drawn a distinction between functional and perceptual aspects of word meaning. Some studies found that perceptual properties are accessed before functional properties, whilst more recent work has found that, at least for words referring to artefacts, functional properties (e.g., 'shoot' for *rifle*) become active before perceptual properties (Moss and Gaskell 1999). Moss and Gaskell (1999) also review research showing that functional properties are particularly resistant to loss in brain-damaged patients, and suggest that functional properties are at the core of concepts for artefacts.

Brain-damaged patients with category-specific impairments have provided vital clues to the organisation of conceptual knowledge. Warrington and Shallice (1984) described a number of patients with bilateral temporal damage who showed poorer identification (through naming or miming) of pictures of living things (e.g., animals, plants) than artefacts (e.g., tools, musical instruments). The opposite pattern has also been observed (Warrington and McCarthy 1987). There have been a number of proposals as to why knowledge of living things and artefacts should be dissociable. According to the sensory-functional theory (Warrington and Shallice 1984) conceptual knowledge is distributed over modality-specific subsystems (Allport 1985; see Saffran and Sholl 1999, for a review). Representations of living things are particularly reliant on brain regions that store visual information, whereas representations of artefacts are particularly reliant on regions that process and store functional information. Selective damage to either of these systems would result in category-specific impairments. Caramazza and Mahon (2003) also argue for neural specificity of representations of different categories, but argue that this differentiation is the result of evolutionary pressure to develop dedicated, and highly efficient, neural circuits for processing types of stimuli that are of adaptive value, and so only specific categories are vulnerable. In contrast, according to the conceptual structure theory

(Tyler and Moss 2001) the difference between artefacts and living things is to do with the correlations between features of concepts and not neuro-anatomical localisation. Amongst living things, such as animals, there are many shared properties (which correlate with biological function, e.g., *legs* and *walking*) and relatively few distinctive properties. But, amongst artefacts, such as tools, there are more distinctive properties (which correlate with function) and fewer shared properties. Tyler and Moss (2001) show that even if all conceptual knowledge is stored in the *same* system, as in a connectionist network, mild damage selectively impairs categories such as animals simply because distinctive properties are more vulnerable, and only at severe levels of damage are artefacts more impaired than living things (because at least the latter retain their shared features). There is also neuro-imaging data from non brain-damaged individuals showing no differences in brain activation for artefacts and living things (Tyler et al. 2003). However, Martin and Chao (2001) found activation in distinct brain areas for nouns referring to tools and animals, and Pulvermüller (2001) found differentiation for verbs (e.g., arm-related verbs as opposed to leg-related verbs).

Simmons and Barsalou (2003) present a 'conceptual topography' theory which attempts to integrate the above approaches by proposing modality-specific representations at levels nearer the sensory surface (accommodating sensory-functional theory), and modality-independent representations resulting from convergence of information across modalities (accommodating conceptual structure theory). An important aspect of this approach is that conceptual knowledge is ultimately 'grounded' in sensory and motor systems. For example, a picture of a drawer activates the motor circuits involved in pushing and pulling actions, so that when having to perform a categorisation task on pictures, if the response is made by pulling a lever, responses are faster for pictures of objects like drawers than for other objects that are not associated with pulling/pushing actions (Barsalou et al. 2003). Pulvermuller (2001) provides even more direct evidence from neuro-imaging – hand-related words (e.g., *waving*) produce activation in the brain region known to be involved in control of the hands, whereas leg-related words (e.g., *walking*) produce activation in the area known to be involved in walking.

Syntax

Architecture (modular or interactive?)

As in the case for meaning access, the debate over the modularity of syntactic processing has focused on the resolution of ambiguity – in this case syntactic ambiguity – and whether the initial syntactic analysis of a sentence is affected by semantic and discourse factors. A modular position has been advocated by Frazier and colleagues (see Frazier 1987, for a review). On this view, a syntactic processing module takes as input the words of a sentence, and on the basis of their grammatical category, and only their grammatical category, constructs a single phrase structure (see Forster 1979, for an earlier expression of this hypothesis). Although there is no commitment to a specific parsing mechanism (see the section on processes below), it is assumed that the parser operates in a highly incremental fashion; that is, by constructing the phrase structure on a word-by-word basis. One consequence of this assumption (which has been amply supported by experimental evidence, see below) is that the processor will often find itself with a choice as to how to attach the incoming word to the current phrase structure. For example, after receiving 'The spy saw the cop with the … ' the processor will know that the word *the* indicates that a noun phrase should be opened. But where should this be attached to the phrase structure of the preceding fragment? Should it be attached to the verb phrase (*saw*) or to the object noun phrase (*the cop*)? Frazier (1987) proposed that the processor deals with these kinds of local syntactic ambiguity by applying structurally defined preferences: namely the principle of 'minimal attachment' (posit the fewest number of nodes) and 'late closure' (attach an incoming word into the structure currently being built). In this example, the principle of minimal attachment dictates that the upcoming noun phrase should be attached to the verb phrase since this involves postulating fewer nodes. Rayner et al. (1983) showed that should this sentence continue with the word *revolver*, reading times in this region are slower than if it continued with *binoculars*.

This, they argue, is because *revolver* is initially attached to the verb phrase, then the thematic processor attempts to interpret it as an instrument of seeing, and on realising that this is implausible, requests an alternative parse from the syntactic processor. When the processor's initial parsing decisions are erroneous in this way, the reader is said to have been 'garden-pathed'. In fact, the Frazier model has come to be referred to as **the garden-path model**.

The garden-path model has received support from a number of other experiments. Because the garden-path effects that have been examined are often extremely local, and pass unnoticed by the reader, sensitive methodologies are necessary in order to record momentary slow-downs in reading. Usually eye movement tracking (see Rayner and Pollatsek 1989, for background to this technique) or self-paced word-by-word reading have been employed. Ferreira and Henderson (1990) compared these two techniques and obtained similar results, although Spivey-Knowlton et al. (1995) provide evidence that under single-word presentation conditions the absence of information from peripheral vision has consequences for parsing. Examples of experiments which have supported the garden-path model are Mitchell (1987) and Van Gompel and Pickering (2001) who showed that the parser's initial decisions respect late closure and ignore verb sub-categorisation information, and Britt et al. (1992) who showed that the difficulty of reduced relatives, which is predicted by minimal attachment (e.g., *The coffee spilled on the rug was difficult to conceal*), is not eased by what was considered to be a supportive discourse context (one which refers to both coffee on a rug and scratches on a table). For other examples see Mitchell (1994), Pickering and van Gompel (2006), and van Gompel and Pickering (2007).

The interactive position makes the prediction that there should be circumstances in which parsing decisions are affected by thematic, semantic, and even discourse factors. The evidence for this is rather equivocal. Taraban and McClelland (1988) replicated the reading time differences for pairs like *The spy saw the cop with the revolver/binoculars* previously obtained by (Rayner et al. 1983), but then showed that the difference in reading times between verb-phrase and noun-phrase attachments was reversed for pairs like *The couple admired the house with a friend/garden* where the non-minimally attached *garden* led to faster reading times. They suggest that parsing preferences are a product of general expectancies based on world knowledge. Trueswell et al. (1994) found that in *The defendant examined by the lawyer turned out to be unreliable* people slow down when reading *by the lawyer* because they initially analyse *defendant* as the agent of *examined*, consistent with the principle of minimal attachment. But this effect disappears in *The evidence examined by the lawyer turned out to be unreliable* because *evidence*, being inanimate, cannot be the agent of *examined*, and so readers immediately adopt the correct reduced relative analysis (however, this result was contested by Clifton et al. 2003, who found that when the head noun is inanimate the garden-path effect is not eliminated entirely, although it is reduced). Altmann and Steedman (1988) showed effects of discourse context on prepositional phrase attachments. For example, the phrase *with the new lock* is non-minimally attached in *The burglar blew open the safe with the new lock* but it was found to be relatively easy to read in a context in which there was a safe with a new lock and a safe with an old lock. They suggested that parsing decisions are influenced by what they called 'The principle of referential support', rather than the purely structural principles proposed by the garden-path model. Spivey-Knowlton et al. (1995) also found evidence of discourse context effects on processing reduced relatives. However, Britt (1994) found evidence that there are circumstances in which the effect of referential support for a prepositional phrase is overcome by what is presumably a stronger preference derived from the thematic structure of the verb (specifically in the case of verbs like *put* which obligatorily take three arguments). For example, the prepositional phrase *on the battle* in *He put the book on the battle onto the chair* is difficult to read even in a referentially supportive context in which there are two books, but this difficulty disappears if the verb *dropped* (for which a locative phrase is optional) is used instead. However, Spivey et al. (2002) show that even this argument structure preference can be overridden if the context is strong enough. They introduced a novel methodology in which a person is seated in front of a table with some objects on it, and their

eye movements are monitored as they hear an instruction. For example there might be an apple on a towel, a towel, and a box. On hearing the instruction *Put the apple on the towel in the box* they have a tendency to look at the apple and then the towel (indicating an initial tendency to interpret *towel* as fulfilling the locative role for *put*). However, this tendency is eliminated if there are two apples, one on a towel and one on a napkin, indicating that a real-world referential context has a stronger effect than one created by discourse.

These results suggest that decisions about how to attach incoming words are based on an interaction between different types of constraint, and there is no architectural barrier that prevents different information sources interacting.

Processing (constraint satisfaction, categorical grammar, syntactic prediction locality theory)

In the light of the mounting evidence for an interactive view of sentence processing, MacDonald et al. (1994) suggest that syntactic decisions are the result of a process of constraint satisfaction, where the constraints come from a variety of sources, and have varying strengths (but for a critique see Frazier 1995). Any particular input string will activate competing hypotheses in a number of domains, and the reader's task is to arrive at an interpretation that is consistent with hypotheses across domains (much as is the case in interactive activation models of word recognition). Take, for example, the input string *The workers lifted* … The morphology of the verb *lifted* is ambiguous between past tense and past participle. However, *lifted* is more frequent in the past tense, and thus more strongly activated. In the domain of syntax, this fragment will activate two phrase structure representations, one a main clause and one a reduced relative. Presumably the main clause structure is the more frequently encountered, and hence the most strongly activated. There are two possible argument structures for *lifted*, one in which the subject is agent and one in which the subject is theme. The assignment of the subject *workers* to the agent role is more plausible, and hence the most strongly activated. Just as in other interactive activation models hypotheses in different domains mutually support each other, whilst hypotheses within the same domain are in competition. In the present example, the most highly active hypotheses at all levels support each other, leading to a very strong preference for the main clause interpretation. If the sentence were to continue *The workers lifted by* … only the activation of the syntactic structure for the reduced relative would be increased, although this might still be temporarily overridden by the biases at other levels. However, given that the goal of the system is to achieve compatibility at all levels then the activation of options in the other domains will eventually be brought into alignment. Furthermore, there may be other factors which support the reduced relative, such as plausibility (as in *The bricks lifted*) or discourse context (two groups of workers which need to be distinguished), the frequency of the past participle form of the verb (e.g., *The workers examined* … where *examined* is more frequent as a past participle form). Trueswell (1996) has provided evidence that indeed the frequency of the past participle versus past tense form of the verb is critical in determining the ease of processing reduced relative structures. Garnsey et al. (1997) explored the effects of putting different information sources into conflict, and McRae et al. (1998) obtained a good fit between human reading data and a computer instantiation of the constraint-based approach. In this latter study corpora were used to establish frequencies of different morphological forms and syntactic structures, and rating studies measured thematic preferences. The advantage of this approach is that it can accommodate conflicting findings such as those noted in the above section in terms of differing strengths of constraints, although as Pickering and van Gompel (2006) note, this makes models such as these difficult to falsify.

Other models of parsing have aimed to be much more specific about the way that syntactic structures are computed, and in doing so have made more of an appeal to linguistic theory. Pritchett (1992) developed a model of parsing based on principles and parameters (P&P) theory [*see* GENERATIVE GRAMMAR] which assumes that all of the principles of universal grammar are satisfied at each moment during parsing. In particular the parser seeks to satisfy the theta-criterion (i.e. assign each noun phrase a

thematic role) at every point in processing. Ambiguities arise when alternative thematic roles are available for a noun phrase, and the processor selects the one that entails the lowest processing cost. This model differs from the garden-path model in its emphasis on thematic processing. A radically different approach is taken by Pickering and Barry (1991) who develop a theory of parsing which does not depend on a phrase-structure grammar, or on empty categories (which are central to the P&P theory). They employ an incremental version of categorial grammar in which each word contains information about how it can be combined with other words, and parsing consists of determining whether the representations of adjacent words can be collapsed together. Since this model makes specific claims about the nature of syntactic representations, the evidence relating to it is dealt with in the following section. For a discussion of other parsing models, see Crocker (1999).

Gibson (1998) developed an approach to syntactic processing that focuses on the issue of complexity – what makes some structures more difficult to process than others? In his syntactic prediction locality theory (SPLT) complexity is determined by storage costs (incurred when a dependency between two elements requires the first to be stored in working memory and a prediction maintained for the second element) and integration costs (the cost of integration at the point where a syntactic prediction is satisfied), both of which are modulated by locality (the number of new discourse elements that have been processed since the syntactic prediction was made). For example, it is well established that subject relative clauses such as in *The reporter who attacked the senator admitted the error* are easier to process than object relative clauses such as in *The reporter who the senator attacked admitted the error*. SPLT explains this difference in terms of the distance between the relative pronoun *who* and its point of integration after *attacked*, which is greater in the object relative because of the introduction of the new discourse referent *the senator*. For evidence supporting the notion of storage and integration costs see Chen et al. (2005), and for the computation of locality in terms of new discourse referents see Warren and Gibson (2002).

Representation (psychological reality of empty categories)

Rather little psycholinguistic work has addressed the issue of the psychological reality of specific theories of syntactic structure. Most work has been carried out in relation to empty categories, as posited by P&P theory [*see* GENERATIVE GRAMMAR], and particularly wh- trace. Even though wh- traces are invisible surface markers of movement operations, it has been claimed that they have detectable effects on sentence processing. Frazier and Clifton (1989) proposed that the parser posits a wh- trace at every structural position that is consistent with the grammar, which they dubbed the 'Filler-Driven' strategy (Gibson's 1998, SPLT makes the same assumption, see above). Compelling evidence for this was obtained by Stowe (1986) who found that garden-path effects occur when a potential trace position is not realised, as after *bring* in *My brother wanted to know who Ruth will bring us home to at Christmas* (i.e. the reader initially posits a trace after *bring* which is coindexed with *who* and so is forced to reanalyse when *us* is encountered). Stowe et al. (1991) and Hickok et al. (1992) showed that a potential gap is postulated even when the resulting interpretation would be implausible. For example, in *Which bucket did the movie director from Hollywood persuade Bill to push?* Hickok et al. (1992) found evidence for reactivation of the wh- filler *bucket* at the potential, but implausible, trace position immediately after *persuade*.

The above experiments could be interpreted as providing evidence for the psychological reality of wh- traces, and of the particular approach to syntax on which they depend (see Fodor 1989 for an elaboration of this line of argument). On the other hand, Pickering and colleagues (Pickering and Barry 1991; Pickering 1994; Traxler and Pickering 1996) argue that an 'immediate association' between a verb and a wh- filler can be accomplished by a parsing mechanism which does not appeal to traces at all (i.e. one based on categorial grammar). For example, Traxler and Pickering (1996) showed that there are circumstances under which a thematic role is assigned even before a so-called trace position has been encountered (as shown by a reaction to the implausibility of *That's the garage with which the*

heartless killer shot the hapless man yesterday afternoon even at the verb *shot*). However, Clahsen and Featherston (1999) argue that since all of the above experiments examined processing immediately following the verb, effects of traces cannot be distinguished from those of thematic analysis. By performing experiments in German they show that reactivation of the wh- filler can occur at other sentence positions, and argue that their data can only be explained by assuming wh- traces, as proposed by P&P theory (see also Ueno and Kluender 2003, for evidence suggesting sensitivity to traces in Japanese scrambling).

General comprehension

According to the **modularity hypothesis**, once a syntactic structure and thematic roles have been assigned, the construction of a full interpretation of a sentence lies in the domain of central, domain general, processes which have access to world knowledge. For this reason, processing architecture ceases to be an issue when these higher-level aspects of comprehension are considered. Early research in this area was concerned with the kind of representations that are formed as the products of the comprehension process, exploring people's memory for sentences or short texts. Theories of processing are less developed than for lower-level aspects of language, and as Gernsbacher and Foertsch (1999) remark, are so similar in spirit that they are difficult to distinguish empirically.

Representation (surface, propositional, situation model)

Researchers have attempted to distinguish three different types of memory representation for text or discourse: surface memory, propositional memory, and situation/mental models. Jarvella (1971) found that people's memory for the precise wording and syntactic form of what they have heard (i.e. surface memory) is remarkably short-lived, and shows sharp drop-offs at major constituent boundaries. This could be because as soon as deeper representations have been formed, surface information is purged from memory (see also Anderson and Paulson 1977). More recent work has also emphasised that short-term recall of sentences is achieved more through a process of regeneration from a conceptual representation than through simply reading off a verbatim record of what was read or heard (Potter and Lombardi 1990; Lombardi and Potter 1992), although how the accuracy and apparent verbatimness of short-term recall is to be accounted for on this view remains an issue (Lee and Williams 1997). Also it should be noted that Keenan et al. (1977) found that long-term verbatim memory can occur for utterances that are of, what they refer to as, 'high interactional content'; that is, utterances that convey wit, humour, sarcasm, or personal criticism. By and large, though, for utterances of more neutral content, there is very rapid loss of surface information.

What form do these deeper levels of representation take? A common proposal is that they should be described in terms of propositional structures. Ratcliff and McKoon (1978) provide an elegant demonstration of how even under conditions where accurate recall of the content of utterances would be difficult, the underlying representation of their propositional structure can implicitly influence a reaction time task. Kintsch et al. (1975) explored the way in which reading time and recall patterns are determined by the propositional structure of texts, showing for instance that recall accuracy is affected by the degree of interconnectedness of arguments, and that the recall of certain aspects of texts is affected by their hierarchical position in the propositional structure. It must be noted, however, that this research employed texts that were generated from a prior propositional analysis, and so whether analyses derived from naturally occurring texts would make the same predictions is not clear (see also Brown and Yule 1983: 106–16 for criticisms of this approach).

Propositional representations do not exhaust the meaning that people are able to derive from text. They capture thematic relations, and make clear the co-reference relations between terms (e.g., the relationship between an anaphoric expression and its antecedent). But they do not encode reference or the inferences that readers make in order to arrive at a full understanding. To capture this kind of representation, researchers have referred to a 'situation model' (Kintsch 1988) or 'mental model' (Johnson-Laird 1983). The former term will be adopted here. This

level represents the content of text or discourse as a state of affairs in the real, or a possible, world. Bransford et al. (1972) were among the first to highlight the importance of this level of representation as constituting what is commonly thought of as 'understanding'. They tested people on passages which were perfectly cohesive in propositional terms, but which in the absence of an appropriate title did not produce any sense of understanding. Much of the work on this approach has focused on spatial descriptions. For example, Bransford et al. (1972) found that after reading *The frog sat on a log. The fish swam under the log* (mixed in with a large number of other mini-texts) readers will later mistakenly judge that they actually read the sentence *The fish swam under the frog*. Since the content of this test sentence does not correspond to a proposition that was presented, it must have been inferred through the construction of a more analogical form of representation. In addition to language of this type, Johnson-Laird (1983) has applied a mental models approach to logical inference. The 'event-indexing' model of Zwaan and Radvansky (1998) describes the elements and dimensions in situation models as being space, time, entity, motivation, and causation. The reader attempts to integrate each new event in an unfolding text with the current situation model with respect to these dimensions. Shifts on a dimension have been shown to lead to increases in processing time.

The dominance of the situation model in comprehension has been highlighted by Barton and Sanford (1993) (see also Sanford 1999) who explored the so-called **Moses Illusion**: the tendency for people to answer the question *How many animals of each sort did Moses put on the ark?* with 'two'. They suggest that this is because words that even vaguely fit supporting background knowledge only receive a shallow semantic analysis which is just sufficient to support construction of a situation model. Perrig and Kintsch (1985) showed that the nature of the situation model that the reader constructs may be affected by the nature of the text, and be subject to individual differences. Schmalhofer and Glavanov (1986) also demonstrated the effect of task demands, and found greater evidence for construction of a situation model when the task emphasised understanding for learning, and more evidence for construction of propositional representations when participants were merely told to summarise the text. Thus, whereas the propositional level of representation may capture the minimum that a person should have extracted from a text in order to support further comprehension processes, the content of the situation model is more variable.

Processing (inferencing, construction-integration model)

Inferences are crucial in the process of constructing and updating situation models. A good deal of research has focused on whether there are certain classes of inference that are made spontaneously and automatically, whereas other types of inference are more optional. The debate here is essentially between memory-based approaches that stress the passive activation of knowledge, or more active 'constructivist' approaches that stress 'effort after meaning' (although it is now acknowledged that both kinds of processes are necessary to explain comprehension, see Guéraud and O'Brien 2005 and accompanying articles). McKoon and Ratcliff's (1992) 'Minimalist Hypothesis' typifies the memory-based approach. They argue that 'only two classes of inference, those based on easily available information and those required for local coherence, are encoded during reading, unless a reader adopts special goals or strategies' (McKoon and Ratcliff 1992: 441). In the first case, information that is strongly associated to words in the text triggers an elaborative inference. For example, McKoon and Ratcliff (1989) showed that when people read *The housewife was learning to be a seamstress and needed practice so she got out the skirt she was making and threaded her needle* they spontaneously activate the concept 'sew' (a similar effect was also obtained by O'Brien et al. 1986). This appears to be an elaborative inference, but one that may be triggered through strong associations with the words in the text (in actual fact, as in much of this type of work, the methodologies only show that a concept is active, and not that a particular inference was actually made). Inferences that are required for local coherence include anaphoric inferences and thematic role assignments (which here have been assumed necessary for construction of a

propositional representation) and what Graesser et al. (1994) refer to as 'causal antecedent' inferences. The latter concern an effort to understand the immediate causes of an event mentioned in the text. For example, Potts et al. (1988) found that after reading … *the husband threw the delicate porcelain vase against the wall. It cost him well over one hundred dollars to replace the vase* there was evidence of activation of the concept 'broke' (implying that they had inferred that the vase broke), whereas this concept was not active after reading … *the husband threw the delicate porcelain vase against the wall. He had been feeling angry for weeks, but had refused to seek help.* Only in the former case is it necessary to infer that the vase broke in order to understand the rest of the text (such inferences are also commonly referred to as 'bridging inferences'). Similarly McKoon and Ratcliff (1989) showed that the concept 'dead' was not active after reading *The director and the cameraman were ready to shoot close-ups when suddenly the actress fell from the 14th storey*, presumably because there is nothing that requires the reader to infer that the actress died (such inferences are commonly referred to as 'elaborative' or 'predictive' inferences). McKoon and Ratcliff (1989) take this result as evidence against the 'constructivist' approach originally advocated by Bransford et al. (1972) and taken up later in the mental/situation model approach. They argue that 'A mental model of a text such as *the actress fell from the 14th story* should include the elaborative inference that she died. It would not be reasonable from the mental model point of view to leave her suspended in mid air'. However, as Glenberg et al. (1994) point out, mental models do not have to be complete representations of real situations; they can be highly schematic. Evidence against elaborative inferences is not evidence against situation models.

The minimalist hypothesis has come under attack for concentrating too much upon local coherence. Graesser et al. (1994) argue that inferences that are required for global coherence are spontaneously drawn as well. These concern the 'superordinate goal' of a character, the moral of the passage, and the emotional reactions of characters (see Graesser et al. 1994, for a review of the evidence). Other research has investigated whether readers spontaneously infer a specific exemplar of a super-ordinate category, for example that *vehicle* may refer to a car in the sentence *The reporter went to the vehicle to look for the papers* (Whitney 1986). Both Whitney (1986) and O'Brien et al. (1986) found evidence that such inferences are only made spontaneously when the super-ordinate term is foregrounded, for example in *The vehicle contained the papers that the reporter was looking for.* This points to the importance of discourse factors in determining what inferences are made spontaneously, making it difficult to maintain a strict minimalist position. Furthermore, Keefe and McDaniel (1993) showed that the concept 'broke' is active after … *the husband threw the delicate porcelain vase against the wall*, it is just that its activation is transitory, and does not persist over the subsequent sentence *He had been feeling angry for weeks, but had refused to seek help.* Thus, elaborative inferences can be made, but their activation may not persist if they are not required to maintain local coherence.

A proper understanding of inferencing will only be achieved if it is seen in the context of a broader process model of comprehension. The most influential of these is Kintsch's (1988, 1998) construction-integration model. In this model the construction phase extracts the propositional structure of the text, whereas the outcome of the integration stage is the situation model. At the construction stage text propositions are represented in a network that captures, for example, the sharing of arguments between propositions. This representation is then allowed to resonate with a knowledge base, activating associated concepts and closely related propositions in a context-independent fashion. For example, both meanings of an ambiguous word like *bank* would be activated, and the proposition underlying Mary baked a cake would activate related ideas such as Mary likes eating her own cake, Mary put the cake in the oven, cake is hot, Mary prepares dinner (Kintsch 1988: 167). The result is the generation of a large number of potential, i.e. 'elaborative', inferences, and a rather incoherent and inconsistent representation. Schmalhofer et al. (2002) report simulations which demonstrate that this initial construction phase is responsible for the activation of 'broke' after … *the husband threw the delicate porcelain vase against the wall.* At the integration stage the network is stabilised by passing activation around it in

successive cycles by a process that Kintsch likens to that occurring in connectionist models. The most highly interconnected propositions receive the most activation, whilst relatively unconnected propositions and associations drop out of the representation. It is through this stabilisation process that ambiguities are resolved, be they lexical (the multiple meanings of *bank*), referential (multiple antecedents for *she*), or syntactic (the temporary ambiguity in *She knew the answer very well*). Once integration is complete, one or more propositions and their associated representations in the situation model may be carried over in working memory to participate in the interpretation of the following clause. In Schmalhofer et al.'s (2002) simulation, the concept 'broke' survives this integration process on..*the husband threw the delicate porcelain vase against the wall* and is hence available for integration with *It cost him well over one hundred dollars to replace the vase* resulting in a bridging inference. On the other hand, 'broke' does not survive the integration process on *He had been feeling angry for weeks*, *but had refused to seek help* because it is not relevant. Thus, bridging inferences are easiest to make when they capitalise on previously activated information (an observation made originally by Sanford and Garrod 1981).

Language production

It is generally assumed that the formulation processes underlying sentence production can be divided into two stages (Garrett 1990). In the first stage the intended message is used to select relevant lemmas, and these are inserted into a representation of the functional argument structure of the sentence to form what Garrett refers to as the 'functional level representation'. Speech errors such as *This spring has a seat in it* (for *This seat has a spring in it*) where the exchanged words are of the same grammatical category can be interpreted as errors in the assignment of words to slots in the functional level representation. In the second stage, syntactic encoding procedures generate a syntactic planning frame that contains slots for the content words specified in the functional representation. These slots also carry diacritic markers for tense and number, and so on. The phonological forms of the relevant lemmas are then inserted into the relevant slots in the planning frame. This explains why when words exchange, they are appropriately inflected for the position they occupy in the syntactic structure (as in *I'd hear one if I knew it* for *I'd know one if I heard it*). Kempen and Hoenkamp (1987) present a model of sentence production that respects these general distinctions, whilst stressing the incremental nature of sentence production. It is also accepted that the size of the planning units narrow progressively from the level of conceptual planning (clausal planning) to lemma access and grammatical encoding (phrasal planning), with the possibility of some degree of processing of later phrases or even clauses (Smith and Wheeldon 1999) and strategic control over the degree of incrementality (Ferriera and Swets 2002).

Syntactic priming studies have provided evidence for the existence of a distinct domain of syntactic representation in production. Conversation analysts have noted that not only do conversational partners repeat each other's lexis they also repeat each other's syntax. Bock and Loebell (1990) reproduced this phenomenon in the laboratory by asking people to alternate between repeating sentences and describing pictures. If a participant repeated a sentence like *The wealthy widow drove an old Mercedes to the church* they were more likely to describe a picture of a girl handing a paintbrush to a boy using a prepositional dative (e.g., 'The girl is handing the paintbrush to the boy') than they would otherwise have been, thereby reproducing the syntactic structure of the earlier sentence. Bock and Loebell (1990) explain their effects in terms of repetition of the specific procedures used to create syntactic structures in production. This is because their subjects were always required to produce the priming sentence as well as the target sentence. However, Branigan et al. (2000) have reported similar priming effects merely from hearing somebody else say a sentence with a particular structure. They suggest that since the syntactic priming effect is cross-modal it must be localised at the lemma level. Lemmas for verbs are connected to 'combinatorial' nodes which represent the combinatorial possibilities for their arguments. Syntactic priming would reflect persistent activation of a combinatorial node that is shared by different verbs. This approach is supported by the finding that biases

towards double object or prepositional datives in production can also be produced simply after presentation of an isolated prime verb (Salamoura and Williams 2006).

The two-stage approach to production has been most fully investigated with respect to the production of words (Schriefers et al. 1990; Indefrey and Levelt 2004). The first, lexicalisation, stage concerns choosing the word which best matches the intended message (as represented at a conceptual level), and the second, form, retrieval stage, concerns accessing and assembling the phonological information that is required to articulate the word. Note that the notion of lexicalisation, as used above, implies the existence of abstract lexical representations which mediate between concepts and word forms. These intermediate representations have been referred to as lemmas, and are also assumed to contain syntactic information associated with the word. Evidence suggesting the existence of lemmas comes from 'tip-of-the-tongue' (TOT) states (Brown 1991), where it is possible for people to have the sensation that they know the word for a particular concept that they want to express (equivalent to having accessed a lemma) but are unable to retrieve its form. Vigliocco et al. (1997) showed that when speakers of Italian are in TOT states they can report the gender of the word even when they are unable to supply any phonological information, providing support for the idea that syntactic information is associated with the lemma. Levelt et al. (1999) provide further arguments for positing a lemma level of representation. However, this assumption has been contested by Caramazza and colleagues, who propose that modality-specific lexeme representations provide independent access to semantic and syntactic information, and that there is no need for a modality-independent lemma level (Caramazza and Miozzo 1997; Caramazza et al. 2001).

There has also been debate over whether the conceptual representations which are input to the production process should be specified in terms of sets of primitive features or in terms of lexical concepts which bear a one-to-one relationship to lemmas. Levelt et al. (1999) favour the non-decompositional approach on both theoretical and empirical grounds. They argue that 'lexical concepts form the terminal vocabulary of the speaker's message construction' (Levelt et al. 1999: 8). This implies that a good deal of language-specific conceptual processing needs to be done to package the intended message in such a way as it can be fed to the production process; what Slobin (1996) referred to as 'thinking for speaking'.

At the level of form retrieval, there is convincing evidence that the phonological form of a word is not simply retrieved as a whole unit, but rather that it is constructed, or 'spelled out', by inserting sub-syllabic units into syllabic frames (Levelt 1989; Levelt et al. 1999). Speech error data have traditionally provided the strongest evidence for this assumption. When sounds exchange between two words they invariably occupy the same position in the syllable structure of the word, as in, for example, *mell wade* (exchange of onsets from *well made*), *bud beggs* (exchange of syllable nuclei from *bed bugs*), *god to seen* (exchange of codas in *gone to seed*). Although it may seem inefficient to construct the form of words when those forms are already lexically represented, Levelt et al. (1999) point out that this is necessary to cope with the fact that in continuous speech, syllabification does not always respect lexical boundaries; that is, the syllable structure of words in citation form does not always correspond to their syllable structure in continuous speech. As regards the types of unit which fill the slots in syllabic frames, the fact that exchanges of phonological features can also occur (as in the voicing exchange which underlies *glear plue sky* for *clear blue sky*) suggests that abstract, and possibly underspecified, phonological representations are involved.

The two main models of the production of single words are Dell's (1986) interactive activation model, and Levelt et al.'s (1999) WEAVER model. There are two main differences between these models. First, Dell allows information to flow bi-directionally between levels whereas Levelt et al. only allow activation to flow from higher to lower levels in a feed-forward network. Second, whereas Dell achieves the binding between phonemes and structural positions through control of timing, Levelt et al.'s model achieves this through a checking operation. However, both models assume that there is competition between lemmas in lexical selection, consistent with evidence obtained by Wheeldon

and Monsell (1994), as well as picture-word interference studies such as those reported by Schreifers et al. (1990). The latter studied the effects of auditorily presented distracter words on picture-naming times, and found that semantically related distracters (e.g., *goat* for a picture of a sheep) produced interference (slower picture naming times) if they occurred just prior to presentation of the picture. The distracter word can be thought of as increasing the activation of a lemma which competes for selection with that corresponding to the target picture. However, whereas the Dell model allows competing, but not selected, lemmas to also activate their phonological form, the Levelt et al. model does not because they assume a more serial processing architecture. Peterson and Savoy (1998) and Jescheniak and Schreifers (1997) have found evidence for phonological activation of non-selected lemmas, provided they are synonyms of the picture name (e.g., *soda* interferes with production of *couch*), a result which supports the interactive activation model (although see Levelt et al. 1999 for discussion). Another feature of the interactive activation approach is that once a lemma has activated phonological representations, these can then back-activate lemmas of similar-sounding words. This assumption permits an elegant explanation of the higher-than-chance incidence of speech errors where the produced word is both semantically and phonologically related to the intended word (e.g., *rat* for *cat*). However, Levelt et al. (1999) argue that there may be alternative explanations for the prevalence of mixed errors. For example, a self-monitoring mechanism (the properties of which are described by Levelt 1989) might be less likely to detect, and prevent, a speech error that is broadly related to the context. More recent work has not resolved this debate (compare Ferreira and Griffin 2003; Jescheniak et al. 2003).

Note that the debate over the appropriate processing architecture for word production mirrors that between interactive and modular models of word recognition in that whilst interactive models permit a bi-directional flow of activation between levels of representation, modular models only permit top-down activation (in production) or bottom-up activation in recognition. At the same time, both approaches stress parallel activation of, and competition between, representational elements. This is a general theme which as we have seen runs through work on visual word recognition, word reading, meaning activation, syntactic processing, and language production, and reflects the dominant way of thinking about psychological processes in modern psycholinguistics.

J. N. W.

Suggestions for further reading

Gaskell, M.G. (2007) *The Oxford Handbook of Psycholinguistics*, Oxford: Oxford University Press.

Harley, T.A. (2008) *The Psychology of Language: From Data to Theory*, 3nd edn, Hove: Psychology Press.

Traxler, M.J. and Gernsbacher, M.A. (2006) *Handbook of Psycholinguistics*, London: Academic Press.

R

Research methods in linguistics

Introduction

Human beings are, mostly, very good at reporting the content of what they have heard or read; but they are far from competent at reporting any talk verbatim. In any conversation, if you stop the person who is speaking and then ask them to repeat exactly what they were just saying, you will see that this is a far from easy task. Alternatively, ask the listener to repeat verbatim what they have just heard. When somebody puts away a book claiming that they have read it thoroughly, ask them to tell you exactly what was said in the last paragraph or even the last sentence. They will find it very hard, if not plain impossible. The only way to know exactly what has just been said, and how it has been said, is to record the interaction.

Human beings are also very bad at reporting on their own use of language: each person thinks they know exactly how they use language but serious analysis will demonstrate that they are not as good as they think they are. For example, during an informal conversation in the pub one evening, one participant was heard to say 'I hate it when people add "wise" on to the end of words like *traffic-wise* or *climate-wise*' and was heard then to use that construction spontaneously several times in the ensuing discussion. Any serious commentary/report on language and its uses, whether that report is to be prescriptive or descriptive, has to be based on rigorous research methods and any research project in linguistics (as in any other academic area) will only be as good as its planning and execution permits. There are advantages and disadvantages to any research methodology but careful planning should eliminate many of the latter.

To research and analyse language in use, therefore, samples of language in use (whether written language or oral language) have to be collected and such samples are then used as data in a research project. Before any data are collected, however, the research area needs to be clearly defined and the research question(s) to be clearly stated, because only then can it be ensured that any data collected will be relevant and useful. Where there is a problem in defining a linguistic area to research, Wray and Bloomer (2006) offer some helpful suggestions.

Techniques for collecting data

There are ethical considerations in the gathering and using of all kinds of language data and these will be dealt with in the section below. Some contexts are particularly problematic in relation to the collection of data. Gathering samples of medical discourse in doctor–patient interviews or in therapeutic interviews is constrained by patient confidentiality requirements. In the UK, it is an offence to record court proceedings in any way, although notes can be taken. Other countries may have different regulations about what may or may not be recorded.

Using recordings from broadcast audio and/or visual sources is, apparently, simply a matter of pressing the button and then collecting the data, but whilst the apparent ease of acquiring the data is clearly an advantage, there are disadvantages in the use of this kind of material. Recording from the radio or from television can

lead to copyright problems if the data are used in a published account of the analysis. Permission to use the data has to be granted and better that such permission is sought at the beginning of the project than after all the analysis has been done. Some TV or radio programmes are good sources of language use that can be hard to record in real life, such as arguments. It is important to remember that many programmes will have been edited before transmission, though fly-on-the-wall broadcasts such as *Big Brother* in the UK or the *Jerry Springer* programme may provide samples of unedited language use. Such editing does not preclude the use of these recordings as long as the implications of editing are remembered in the analysis. There are limits in the kinds of language use that will be available: for example, slips of the tongue might not be very frequent in a radio play.

Recording language in use in non-broadcast contexts (seminars, dinner table conversations, interviews, arguments) needs to be set up carefully. It is important to ensure that recordings are sufficiently clear to allow for transcription of sound or visual matters. Careful planning of when and where (is it a noisy room? will there be interruptions?) the data are to be recorded together with a trial run can eliminate many of the difficulties, as can simply checking that the equipment works (is there too much interference from other electronic equipment in the room or the neighbouring area to get good-quality sound recording?). If recording a group of people to explore turn-taking or other features of a talk event, can everybody's voice be heard sufficiently clearly in terms of what each person says and in terms of identifying each voice accurately? If the participants are performing a task while their talk is being recorded, will the task itself create so much background noise that it blocks out the talking? The language recorded may be task focused, as for example in MerriMaps (Merrison and Merrison 2003; see below), or it may be an open-ended discussion on a preset topic (whether that topic is about language itself or not, it is better to choose a reasonably controversial topic where differing opinions can be expressed), or it may be simply a recording of any general unplanned conversation such as family conversation at a mealtime or student talk over a cup of coffee.

For all the problems of organising the collection of audio/visual data, the researcher does know that they are using language data that will never have been analysed by anybody else and it is often, but by no means always, more interesting to work on data that the researcher has collected him/herself rather than on data collected by somebody else. Of course, authentic language use may or may not provide rich data for the particular linguistic phenomenon under consideration and so it is always a slightly riskier procedure in terms of data collection than some other collection methods.

Oral data are important in the analysis of children's acquisition of language or of the development of second language learners' proficiency in whatever target language is being learnt. Oral recordings are clearly essential in studies of an individual's or a group's accent. Political speeches are best studied with an oral recording and not just from the written words.

Using written text

Just as there is a wealth of oral text around on which to base language research, there is also a wealth of written text. Quantity of text is less important than the relevance of the texts chosen to the topic being researched. Text that is rich in the number of examples is more useful to the researcher than a great amount of text with few relevant examples. Electronic text provides another mode of text which can be seen as having some of the characteristics of either oral or written text or some features of both traditional modes. Email language has been the subject of much research and the language of texting has also been explored [*see* LANGUAGE AND NEW TECHNOLOGIES].

Written texts that have already been considered but which are renewed in line with current events provide excellent data for research projects. One might consider the following:

- political manifestos (major or minor parties, national or local election material or single issue fliers pushed through the letter box);
- international comparisons in terms of national elections and how they are managed linguistically in each country;
- advertisements in a whole range of written productions (magazines targeted at different

audiences, for similar products in different newspapers or across international boundaries, or the language used on hoardings at any given time in a particular locality);
- company reports;
- reports from charities which are also trying to raise funds for the next humanitarian project.

The list is endless; but the main point to bear in mind is that the text which is gathered should be focused and, if the project is to compare two or more forms of text, genuinely comparable: to compare the language used in the writing of a child of seven retelling the story of a video that they have just watched with the oral language used by a stroke victim seems just too far apart and with too many variables for any sensible comparative study to be achieved.

Literary stylistics considers the style of writing of any given literary author and might be considered in terms of a single text, whether novel, sonnet or play. There might be an interest in exploring the changing language features of a given author over the period of their writing. Print versions of published texts are, of course, easily available but many literary texts are also available online. Electronic versions of texts make the study of word frequencies in a written text much easier to handle, and there is software available (e.g. WordSmith Tools) to help the researcher. To check manually, for example, which reporting words are used in respect of each character is an enormous task; a computer can handle this more easily (and probably more accurately) than a person. A computer will not miss any occurrences of a given word where the question relates to how that word is used in the text(s) being analysed (e.g. is the word *dry* used more often to mean the opposite of wet, the opposite of sweet or in relation to a dry sense of humour?) or where the research question relates to the collocations of the lexical item being explored, along the lines of 'you shall know a word by the company it keeps' (Firth in Wray and Bloomer 2006: 198). Emerging and apparently new meanings of words such as *cool*, *wicked* or *cheers* are more easily explored when the computer can scan through millions of words of text to find examples from, say, the last year. Similarly, a computer can be used to compare articles on the same topic in different newspapers/magazines/electronic formats to compare language use in relation to audience and medium.

For the researcher who might not want to collect their own data, **corpora** of language use are now widely available [*see* CORPUS LINGUISITICS]. Wray and Bloomer (2006: 200) list some sites which indicate what corpora are available (try http://nora.hd.uib.no/text.htm or www.devoted.to/corpora or http://torvald.aksis.uib.no/corpora/sites.html) and also list some of the major English language corpora available such as the Bank of English, the British National Corpus and the International Corpus of English. The **BBC Voices project** [*see* LANGUAGE SURVEYS] will also provide a large number of samples of English together with some discussion of the various regional accents. Inevitably, all these corpora vary in terms of the samples of language use they contain as the compilers had different interests in the compilation. There are also different access rights for the different corpora and these access rights need checking carefully.

The World Wide Web is in some ways the largest electronic corpus with samples of many kinds of language use ripe for research, but, unlike other specifically linguistic corpora mentioned earlier, **language on the web** is not tagged for analysis and it would also be very hard to be certain of the actual source of the language in relation to informant characteristics. Corpora of literary texts are available in traditional print form, and many are also available online; the electronic format makes analysis of, say, collocations or word frequencies easier to handle.

It is perfectly possible to create a corpus, but an enormous amount of material (and the analysis thereof) is needed to make it a worthwhile project. The corpora mentioned in the previous paragraph each contain millions of words (whether oral or written in original form) and their size is both an advantage (stronger claims can be made on the analysis of larger chunks of language) and a disadvantage (the sheer amount of data can be daunting for the analyst). Copyright and informant permission become important issues if the new corpus (or an analysis of data from it) is to be made publicly available: it is illegal simply to scan printed works into an electronic medium without permission. Similarly

permission from any speakers needs to be gained for the use of oral language.

Questionnaires, **focus groups** and **interviews** are useful techniques for exploring dialect usage, sociolinguistic issues such as attitudes to language use and language change, to changing views on acceptable language use and to slang or swearing. These techniques can also be used to discover students' motivation when learning a foreign language or their opinion of the materials being used, to explore language use in a particular region/country, or to explore individuals' memories of language use whether in terms of changing dialects or changing methods in language teaching and learning.

Questionnaires are often more useful for gaining information on attitudes to language and to language use than on actual language use, but they need to be written very carefully to ensure that the information received can be used productively. Answers to questions do not tell you what the informant actually does in relation to language use (self-report is notoriously unreliable) but they do tell you what the informant thinks that they do. Questions, therefore, may directly address the issue under consideration or they may be phrased more indirectly. **Closed questions**, which invite the participant to select from a pre-determined set of responses with tick boxes allow the researcher to count the positive or negative answers; like **multiple choice questions** (apparently objective but very hard to design well) they offer possible responses but perhaps not the response that the informant really wants to give; using a **Lickert scale** can limit the responses available but allow the informant scope for more nuanced replies; **open-ended questions**, which invite the respondent to write a quantity of prose on the topic in focus, can produce verbose answers that are hard (and sometimes almost impossible) to analyse; a long questionnaire might put off an informant simply by its length; a question that requires disclosure of personal or painful information might not be answered. It can be argued that more questionnaires fail because the questions have been poorly formulated or have been badly presented than for other reasons. The rate of return of questionnaires can be very low unless measures are taken to ensure that informants reply within a useful time-frame for the researcher. A low rate of return can limit the claims that can be made from the results.

Interviews may be with individuals or with groups and can be seen as an oral version of a questionnaire. Arguably, they need to be semi-scripted to ensure that all informants are asked the same questions so that the results can be analysed and different responses sensibly compared. Completely scripting an interview can be very constraining whereas partial scripting by choosing central questions for discussion allows the interviewer to develop particular lines of enquiry as necessary while still maintaining the same pattern of interview for all informants. Similarly to questionnaires, the questions need very careful devising to ensure that they can be answered by the informants and that the answers will provide relevant information for the researcher. Whether scripted or partially scripted, the interviewer needs to be careful not to appear to interrogate (unless the purpose of using an interview format is to explore how somebody reacts to an interrogation) and to allow the interviewee to relate other information (potentially interesting data in their own right even if for another project) even though such information may not be the main purpose of the interview. Whatever the number of informants, interviewing each person can take an inordinate amount of time: one solution is to use several interviewers but then moderation and comparability issues become important. Another solution is to arrange group interviews where three or four people are interviewed at the same time: the issue here is to ensure that each participant has an equal chance to participate, a problem that can also arise within focus groups.

Focus groups ask informants to focus on a particular topic for discussion and are often used to find out public opinion in political and commercial settings. From a linguistic perspective, the aim might be to encourage the participants to talk about language use and their attitudes to linguistic phenomena or it might be to offer non-linguistic topics for discussion and to use the resulting talk as the basis for research on, say, turn management in group talk. If present in the discussion at all, the researcher's role is that of a facilitator ensuring that all topics are discussed and that everybody has a chance to speak; it is not the role of a director determining, for

example, the order of discussion topics or nominating the order of speaking turns. If the researcher does take part in the discussion, there is a serious risk that, because the researcher knows what they are looking for in terms of the overall research project, they might unwittingly manipulate the discussion to generate particular points and not others. It might, therefore, be decided that it is better for the researcher not to be present in the discussion and for the facilitator role to be given to one of the participants whilst being aware that some participants might turn such a role into that of director rather than simply allowing the discussion to prosper (as it will, if well planned) within the given parameters. Careful preparation can usually prevent this happening. Surprises are more likely in focus groups than in planned interviews because discussions can suddenly set off in surprising (though often useful) directions.

Observation techniques for the collection of data are not as straightforward as might appear. What is being observed might be a very constrained task or might be a much freer discussion or activity. For example, **MerriMaps** (Merrison and Merrison 2003) provide an example of a constrained task: a Speech and Language Therapist (SaLT) (the information giver) provides for the client/receiver directions on how to move round a map, the directions deliberately allowing for the client (the information receiver) to seek clarification during the interaction.

One disadvantage in observing an individual (or a small group of people) carrying out a task relates to the **Observer's Paradox** which recognises that simply being observed may affect the way that a participant carries out a task – but to record secretly (or to observe indirectly from another room without telling the participants) is regarded as unethical and unfair (see below). This paradox applies whether the observer is in the room with the informant or in a neighbouring room with appropriate viewing possibilities, or whether the observation is achieved by leaving a camera running in the room for the film to be viewed later as was the approach used with MerriMaps (Merrison and Merrison 2003). It is important to know what is being observed or looked for and to know how this will be recognised. If researching turn-taking in conversation, how will a speaker nomination be recognised: must there be the use of the name of the next speaker or might nomination be achieved by other means? It is important to be clear why observing this particular (group of) informant(s) is relevant to the project: the linguistic issue might be the use of language in relation to a particular disability or to a particular developmental stage in children. One potential difficulty arising from this technique of gathering language data is the sheer quantity of data that might emerge. There is a balance to be struck between quantity and quality of data: simply having a lot of data (in terms of hours recorded or number of words written) may not provide enough examples of the phenomena which are being researched so the guiding principle has to be to get good-quality (defined as rich in providing samples of the specific piece of language use being analysed) data of whatever length.

Case studies tend to be used when analysing the language use of an individual and are particularly useful over a period of time for a longitudinal study. Research on a child's acquisition of language, for example, might rely on case study data over a period of time and might explore a range of the child's developing language abilities, whether these are regarded as peculiar to the child or as a way of adding to the general body of knowledge about most children's language acquisition procedures. The individual may display linguistic behaviour that is interesting but is not encountered frequently and so the intention is not to generalise to other patterns of behaviour but to reveal what is going on with this particular individual's use of language. Very often, therefore, case studies might be used in work related to speech and language therapy consultations or in other therapeutic contexts. Data gathering techniques may involve any of those outlined above with the attendant advantages and disadvantages of each, with the added recognition that in such contexts as these, individual reactions may be more extreme. The ethical considerations when working in these contexts are also particularly significant.

One way of exploring, say, a child's developing use of language is to ask the adult carer(s) of the child to maintain a diary of new active uses of lexical items and **diaries**, despite the problems of self-report referred to in the introduction, do

have their uses provided the researcher remains aware of the limitations. If researching instances of tip-of-the-tongue phenomena [*see* PSYCHOLINGUISTICS], the amount of data that would need to be recorded would be immense and might in the end lead to very poor data with very few examples of the target phenomena. Nobody can predict when such phenomena are going to occur to arrange the recordings at appropriate times and places. Therefore, perhaps it is better to ask informants to note down such instances as they occur and to classify these instances in relation to given parameters as provided by the researcher (e.g. times of occurrence in relation to personal well-being or tiredness; in relation to topic of conversation at the time or in relation to interlocutor) to ensure that the data so gained will relate as closely as possible to the situational factors that might be the target of the research. If considering very early vocabulary acquisition in children, a diary might be provided by an adult carer of the child to record first instances of use of new vocabulary items as apparent imitations in contrast to spontaneous use by the child themself.

Whilst much current research in linguistics is based on authentic language in use and on a body of data (however stored, however gathered) collected from such a naturalistic language-using setting, there are research projects based on **experiments** set up deliberately to see how informants use language in a constrained situation, the constraints being to try to ensure that only the focus of the research can vary and therefore produce useful results. The focus of the research, for example, might be to see how two different groups, matched as far as possible in all ways bar the one variable which is the focus of the enquiry (age, gender, education, for example) might carry out the same task or to see how two groups matched completely (as far as this is possible) carry out the same task (e.g. learning vocabulary items) but with different constraints (e.g. one group has the new vocabulary presented in context while the other group learns the vocabulary as lists of new lexical items).

Like all other research methods, experiments need to be based on very clear research questions. To research the use of language in a political setting by means of an experimental approach would be almost impossible as the sociolinguistic contexts in such language use are not conducive to experimental work. It is, however, perfectly reasonable to ask, in response to the assertion that women use more colour terms than men, whether children of primary school age will demonstrate the same propensity and to test this experimentally with comparable groups of boys and girls being asked to name colours as they appear on a paint or colour chart. The hypothesis in this case might be that, like women whose behaviour is reported in other experimental research, the girls will use more detailed colour terms than the boys. If they do, one can argue that the hypothesis has been supported or proved (though the claim to proof will be relative to the size of sample). In planning any experiment, however, it is useful to wonder what other results might mean. If the numbers are roughly the same, what is this telling the researcher about boys' and girls' use of colour terminology? It may be that there is no difference in boys' and girls' use of colour terminology or that the experiment did not manage to capture any differential uses that there might be or that the numbers were so close to each other that there was no statistical significance in the results. MerriMaps (Merrison and Merrison 2003) were used in experimental conditions with the hypothesis that there would be less clarification provided in interaction between the SaLT and children with pragmatic language impairment than between the SaLT and children with specific (but not pragmatic) language impairment and between the SaLT and children with no language impairment. More information on setting up experiments in linguistic research is available in Wray and Bloomer (2006: Chapter 12).

Some research projects are not based on data at all. Chomsky noted that native speaker/hearers recognised that certain utterances (e.g. [1]) were acceptable and others (e.g. [2]) were not.

(1) Pigs have curly tails.
(2) *Pigs curly have tails.

Native speaker/hearers also understand significant differences of meaning in apparently similarly structured sentences as in (3) and (4) where John is trying to please somebody else in (3) but is being pleased in (4).

(3) John is eager to please.
(4) John is easy to please.

A similar example recently noticed in obituaries is how often the deceased is described as 'much loved husband of X, devoted grandfather of Y' where the two clauses look to have an identical structure but in the clause using *loved* clearly the deceased is the one who was loved by others and in the clause using *devoted* the deceased is the one who was devoted to others – is this what the writers intended?

Chomsky's question was what is stored in the human brain that enables speaker/hearers to distinguish between these structures and to know whether an utterance is grammatical or not. From these observations, he endeavoured to specify the syntactic rules as they must be stored in the brain to allow the native speaker/hearer to produce any, all and only grammatical sentences in the language but he did not operate on, or, arguably, need, a body of data to work on. If you accept that there is no doubt that many people often produce ungrammatical utterances (*ungrammatical* can only be used as a term once the grammatical rules have been established, of course), you can still work on providing the logical deep structure needed to allow speaker/hearers to use their language. There is a difference between arguing that an utterance is ungrammatical compared with arguing that an utterance is right/wrong (right or wrong in relation to what?) where so many other issues come into play that most linguists simply do not talk about language use being right or wrong, using instead terms such as (in) appropriate, (un)grammatical depending on the context of their commentary.

Many psycholinguistic research projects have had to operate on a non data-based approach for very obvious reasons. To find out what goes on in the brain is impossible in practical empirical methods of enquiry and Harley (2001: 4) argues that initially the discipline of psycholinguistics was more about 'the psychology of linguistic theory'. The subtitle of his book, *From Data to Theory*, shows the importance of recognising the importance of language performance in relation to any theoretical insights that might be offered not only about 'how we acquire language, and the way in which it interacts with other psychological systems' (Harley 2001: 4) but also suggests that there is not a clear distinction between theoretical and data-driven research projects as might have been suggested even in this entry. Perhaps a theoretical understanding of what is happening in tip-of-the-tongue phenomena can only be based on some understanding of what the speaker thinks is going on which can then be used to create a theoretical perspective with wider relevance than can perhaps be argued from relatively limited data.

Ethical issues

Confidentiality and/or the anonymity of all informants in linguistic (as in other) research must be maintained. Keeping data anonymous means that the researcher themself does not know who provided the information/response, whereas preserving confidentiality means that the researcher will not reveal any information that they have about the informants.

If responses are to be written, it might be possible to recognise individual handwriting styles. In such a case, to keep to a promise of anonymity, collection of written data might need to be by electronic form rather than handwriting. If the research project needs the data to be handwritten, then the informants can be promised only that their identities will be kept confidential by the researcher (by coding the responses rather than using the informants' names, for example) so that the individual identities, while known to the researcher who has promised confidentiality, cannot be discovered by anyone else.

Voices can always be recognised by those who know the individual involved. In the collection of oral data, it might be necessary to reassure participants that while the voices might not be disguised (as can happen in national news bulletins to protect an informant to a particular story) the identity of the speaker will be kept confidential. If oral data are to be video-recorded, it might be necessary to specify who will have access to the original video-recordings and to assure participants that nobody else will have access. If the video-recordings are taken from online broadcasts or from the web, it is advisable to seek permission to use the clips from the broadcaster, especially if the intention is to publish the

research findings. It may even be necessary to seek permission from those in the clips (e.g. the residents in the *Big Brother* house) before using the data. If the data involve children, then permission needs to be sought from the parents as well as from the child and if the data are obtained from children while in school, then the permission of the school is also needed.

If using previously published materials such as a novel or play, permission should be sought from the publishers or the copyright holder if it is not the publisher. This becomes particularly problematic in the case of using material from the World Wide Web as it is not always clear who the author is. Individual Wikipedia entries, for example, have a multiplicity of authors and it would be nearly impossible to trace all the individuals.

Many of the ethical issues considered here are covered by legislation – in the UK it is covered by the **Data Protection Act** (1998) whose purpose is to protect the rights of people in terms of ensuring that any data collected about an individual are not used for purposes of which the informant may not be aware.

Analysing the data

Describing something lists the characteristics of the item under discussion (e.g. a pavlova is, according to Encarta, 'a dessert consisting of a large meringue shell filled with cream and fruit' which is so called because it was first created in honour of the ballet dancer, Anna Pavlova) whereas analysing something determines the component parts and shows how, together, they create the whole (meringue [egg white and sugar whipped together] + fruit [often raspberries] + [whipped] cream = pavlova). Analysing linguistic data, therefore, involves more than simply relating the fact that Jo disagreed with everything that Chris said or that Chris spoke twenty-four times in the conversation and that Sam said very little. Analysing linguistic data might involve observing how often Jo, Chris and Sam each speaks during a talk event and also considering in what circumstances and to what purpose each speaks. Depending on the purpose of the research, one might explore how each of them adjusts their use of language to accommodate the needs and/or (dis)abilities of their interlocutors, and try to explain the grounds on which those choices are made.

Many take the view that only results that can be statistically validated and which are statistically significant are worth reporting. In terms of talking about language use, though, it has to be recognised that not everything can be counted. The expression of meaning occurs through the speaker's/writer's linguistic, paralinguistic and stylistic choices operating together and not in isolation from each other: count one aspect only and that count diminishes what is actually going on in the act of communication. Clearly, the occurrence of particular lexical items throughout a novel or the frequency of pauses in an individual's speech in a particular context or how often the next speaker is nominated by name are examples of linguistic phenomena that can be counted, but the significance of the resulting number is unclear. It is probably more interesting to explore how the use of key lexical items in a novel varies as the narration develops rather than simply the number of times that the lexical item is used, or to examine the length of pauses in relation to the kind of interaction at the time of the pause rather than simply the number and then length of the pauses (in any given conversation, the mood of the interaction may vary from reflective to argumentative to informative and back again).

There is a difference between providing numbers and providing statistics. To report that something happened a given number of times during different conversations can be done discursively, can be put into a graph or a pie-chart if there is some comparison to be made or can be put into a table. To analyse the significance of these numbers, **statistical analysis** will show whether 'the results you got are worth taking seriously' (Wray and Bloomer 2006: 213) or whether in fact the results could be gained by pure chance. A beginner's guide (necessary for most but by no means all linguists) to statistics is available in Wray and Bloomer (2006: Chapter 19) and there are many other excellent guides on the market (e.g. Woods et al. 1986; Greene and D'Oliviera 2005).

How much statistical data is to be presented will depend on the requirements of the audience of the project report (or essay/dissertation) and on the project itself. Statistics can support the qualitative claims that are made but there are

also many who are very suspicious of statistical claims because of the perceived misuse that statistics can be put to – the well-known phrase about 'lies, damned lies and statistics' comes to mind.

When statistics are to be used, care needs to be exercised. Let us return to the example of Jo, Chris and Sam. If Jo is the only one to use a particular linguistic feature, this could be reported as saying that '33 per cent of the participants did X' or as saying that 'only one of the three, Jo, did X'. There is an argument that the latter is clearer: the fewer the number of informants, the less need there might be for statistics and less technical ways of reporting the information are available (e.g. 'one in three'/'only one of the three participants did X'). If all three demonstrated the same feature, it is true that '100 per cent of the participants demonstrated feature H' but this is only three people and any claim based on three informants is more limited than a claim based on 300 or 3,000 participants where the use of percentages because of the larger numbers might be a more sensible and a clearer way of reporting the results. Similarly, it is not particularly interesting to report the average (or mean) length of sentences in a novel as this average can hide the extremes of sentence length that sometimes occur and which, in the discourse of the narration, are reflective of a particularly important event in the plot.

Much linguistic research involves the analysis of data obtained through observational or experimental approaches to language in use and requires both quantitative and qualitative analytical techniques. All well-planned, well-executed and well-analysed linguistic research provides fascinating insights into the myriad ways that individuals use language. Surely, such an important aspect of human communication, indeed some claim that human ability to use language is one of the defining characteristics of humanity itself, deserves to be researched as carefully and as accurately as possible so that there is evidence to support the claims being made.

A. B.

Suggestions for further reading

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Rhetoric

Rhetoric is an ambiguous term. Among other things, it refers to an ancient discipline with an uneven, complex history, an activity connected to the pragmatic dimension of language, a body of precepts about that activity, a teaching tradition dedicated to the cultivation of citizens who have the capacity to speak and write persuasively, and a mode of critical analysis designed to help citizens resist symbolic techniques of repression.

Confronted with this ambiguity, rhetoricians have not been able to settle themselves within tidy disciplinary borders but have manoeuvred around a set of permanently unsettled basic questions: is rhetoric a global symbolic activity that pertains to all discourse and that invites inquiry into the means by which discourse achieves its purposes? Or should it be conceived as a more limited activity that operates within the domain of civic affairs and that implicitly or explicitly connects with a set of ethical and political values? Is rhetoric an 'art' (i.e. a more-or-less systematic body of principles) that provides the means for effecting persuasion and/or standards for assessing the effectiveness of efforts at persuasion? Or is rhetorical activity too diffuse and too contingent on particular occasions and circumstances to allow for such systematisation? Is rhetoric best conceived as the study of how human agents attempt to influence others? Or is it best approached from the receiver's perspective? Should rhetoric concentrate on particular encounters? Or should it privilege larger discursive formations? Is it possible or desirable to treat rhetoric as method that operates technically and indifferently on the subjects it treats? Or are method and subject – form and content – so intimately linked as to be inseparable?

The question of rhetoric's basic identity, then, is itself a rhetorical issue, conditioned as much by history, context, and interests as the artefacts and events rhetoricians seek to understand. At the same time, however, in the midst of this contingency, a legacy of teaching rhetoric has persevered from the lessons in the art of *logos* in ancient Greece to the array of courses in public speaking, composition and argumentation offered at universities in the USA (and increasingly at universities throughout the world). The source of

this continuity suggests a key point: rhetoric sustains its integrity less as a bounded domain of knowledge than as a commitment to develop a capacity for performative and critical engagement with discourse in action. Viewed from this angle, rhetoric emerges most clearly as a scholarly and pedagogical commitment – as a sense of a duty to understand and cultivate the available means for adjusting and altering the symbolic worlds we inhabit.

By conceiving rhetoric in terms of 'duty', we recall the classical notion of the **duties** or **offices** (*officia*) connected with the art, and we will use this scheme to organise our account of the historical lore of rhetoric and its status in current scholarship. The full list of these duties includes five items: **invention**, **style**, **arrangement**, **delivery** and **memory**. Memory, however, faded from attention in the later tradition and has become – quite ironically – a forgotten office of rhetoric. Consequently, we will pass over it other than to recommend the excellent studies by Yates (1966) and Carruthers (1990) that deal with memory in detail and from different perspectives.

Before turning to our account of rhetoric through its offices, we need to issue an important caveat. When presented seriatim and in synoptic form, the **components of rhetoric** may appear as self-contained, isolated modules. But, as all well-informed students of the tradition know, the categories always overlap considerably, and the best writers in the tradition (notably Cicero in his *De oratore*) both use these categories (as a convenient mechanism for ordering the resources of the art) and then dismantle them (as contrary to the interanimation of resources needed for rhetorical performance). We are mindful of the limits imposed by our schematic, use it as a necessary concession to the space available to us, and recommend Cicero's *De oratore* and Burke's *A Rhetoric of Motives* (1969) as antidotes to our synoptic oversimplifications.

Invention

Conventionally the first and often regarded as the most important element of rhetoric, invention refers to the discovery of arguments relevant to a particular case. Throughout most of the rhetorical tradition, the art of invention has relied primarily on the conception and explication of systems of **topics** (*loci* or *topoi*). The topics provide 'regions' or 'seats' where generic materials and/or types of argument may be found and applied to particular cases. *The Rhetoric to Alexander*, a technical treatise of the later fourth century BC, presents what is probably the earliest extant version of topics, and they appear as a loosely arranged set of possible **grounds for building an argument**, such as: justice, legality, expediency, honorability, practicability and necessity. Each of these headings is divided into constituents, and the rhetor is to draw arguments from this inventory of headings.

Aristotle's *Rhetoric* attempts a more systematic and theoretically oriented approach to invention in general and the topics in particular. Owing to difficulties in interpreting the text, however, the nature of this theory has been and remains a matter of contention. The text does clearly divide all rhetorical arguments into two species – the **enthymeme**, which is the rhetorical form of deduction, and the **example**, which is the rhetorical form of induction. Aristotle places greater emphasis on the enthymeme, but no clear definition of it appears in the text, and the attempt to specify its meaning has generated controversy that dates back to Renaissance commentators and continues to the present. The once widely accepted view that the enthymeme is a 'truncated syllogism' (i.e. a syllogism with a premise or the conclusion unexpressed) is no longer accepted by most scholars. Recent scholarship tends to view the enthymeme as an argument expressed in ordinary language and grounded in social knowledge, and it is deductive only in the loose sense that the conclusion follows from one or more other statements.

Aristotle says that enthymemes are drawn from topics, but again his conception of topics is a matter of dispute. Many scholars believe that he divides the topics into two classes – universal and special, the difference being that the **special topics** apply only to a specific subject, while the **universal topics** apply to any and all subjects. On this view, the special topics are relevant to one of the three **genres of rhetoric** identified by Aristotle (deliberative, judicial and ceremonial) but the universal topics identify forms of inference that apply to any type of rhetoric.

Aristotle also designates three **modes of proof**: logical proof based on reasoning, emotional proof based on appeals to the audience, 'ethical' or 'ethotic' proof based upon the character of the speaker. This tripartite distinction has exercised a strong and enduring influence on subsequent rhetorics, and the emotional and ethotic appeals have generally, but not always, been regarded as categorically distinct from logical proof and not connected to the enthymeme and its associated doctrine of topics.

During the Hellenistic period, rhetoricians developed two other notable **systems for topical invention**. One of these specifies the material potentially available for constructing arguments, and it uses forensic advocacy as the paradigm for rhetorical argumentation. Within the terms of this approach, the legal case revolves around an issue that is in doubt and involves a person and an act, and the matter of arguments arises from the attributes of the person and the act. Topics relevant to the person include social status, age, interests, reputation, and the like. Those relevant to the act refer to where and when the act occurred, how it was done, how it compares to other acts and other similar considerations. This system is presented in great detail by Cicero, Quintilian, and other later rhetoricians and eventually finds application in contexts far removed from legal argumentation, such as in medieval textbooks on composing poetry.

The other prominent Hellenistic approach to the topics, known as the ***stasis* system**, focuses upon issues. In this scheme, arguments are viewed as arising from the conflicting positions of arguers, and the resolution of this conflict depends upon locating and resolving the issue that rests at the point where the arguers disagree. The legal case is again the primary referent, and while the number and classification of issues varies somewhat, the most typical version distinguishes four types of issues: (1) fact (did the defendant take money from the temple?); (2) definition (is this act robbery or sacrilege?); (3) quality (were there mitigating circumstances? – e.g., was the defendant forced to do it?); and (4) transference (is this the right time and place to try the case?).

These topical systems changed configuration and application over time, but they remained at the core of instruction in rhetorical invention through the Middle Ages and the Renaissance. In the modern academy, however, they were increasingly dismissed as artificial devices that distracted attention from the facts of the case or as impure and imprecise modes of reasoning that needed replacement by a more rigorous logical apparatus. The demise of the topics corresponded with the tendency to strip invention from rhetoric and to implicitly or explicitly assign it to logic or to specialised, 'substantive' domains of inquiry, and this tendency both contributed to and reflected the eclipse of rhetoric as a serious discipline.

The revival of rhetoric and informal logic in the second half of the twentieth century sparked a renewed interest in topical reasoning. In his influential book, *The Uses of Argument*, Stephen Toulmin (1958/2003) developed a non-formal approach to argumentation that pivoted on the conception of **warrants** or inferential connectives, and these warrants bear a strong functional resemblance to the topics. More recently, informal logicians, such as Douglas Walton, have conceived of argumentative 'schemes' that function much like the topics found in pre-modern treatises on dialectic and rhetoric (see, e.g., Walton et al. 2008). The most direct and significant revival of the topics appears in the work of the Belgian philosopher and rhetorician Chaïm Perelman. *The New Rhetoric: A Treatise on Argumentation*, which Perelman co-authored with Lucie Olbrechts-Tyteca (1969), sought to use the pre-modern tradition of rhetoric and dialectic to counter the Cartesian-inspired conceptions of reason and reasoning that have dominated modern Western philosophy. The bulk of this treatise consists of a revised and updated version of the classical lore on topics. Perelman has exerted a powerful influence on contemporary rhetoricians, has had a significant impact in informal logic, and a smaller but still detectable influence on legal studies and other related disciplines.

Style

Traditional rhetorics treat style in respect to the **four virtues** of correctness, clarity, ornamentation and propriety. Correctness and clarity usually receive only brief notice. **Ornamentation**

is treated in the greatest detail and becomes the object of technical and sometimes tediously extended analysis. This analysis begins with a division between the choice of words and their arrangement. Word choice, in turn, has three sub-categories: tropes, figures of speech and figures of thought.

The technical term **trope** comes from the Greek word meaning 'turn', and as Rowe (1997: 124) notes, its rhetorical usage suggests a turn of phrase or a manner of speaking. In the *Institutio oratoria*, Quintilian defines a trope as 'the artistic alteration or a word or phrase from its proper meaning to another' (7.5.1) and identifies twelve tropes: **metaphor**, **synecdoche**, **metonymy**, **antonomasia**, **onomatopoeia**, **catachresis**, **epithet**, **allegory**, **irony**, **periphrasis**, **hyperbaton** and **hyperbole**. The definition of trope and the number and types of tropes vary widely from one rhetorician to the next. Often, the term simply designates the figures an author regards as the most prominent or important.

In most traditional accounts, a **figure** is an intentional deviation from what is ordinary or simple. When the deviation involves words, we have a **figure of speech**, but when the deviation involves sense, ideas, or feelings, we have a **figure of thought**. The difference between the two, as Cicero explains it (*De oratore* 3.200), is that a figure of speech disappears if the words are changed, while a figure of thought abides however it is worded. Abstractly considered, this is a reasonably clear distinction, and there are some cases where it works quite well. Once again, however, the categories break down when extended in detail or subjected to systematic analysis, and the distinction has often led to confusion.

Despite complaints about such confusions and about the 'cosmetic' nature of these devices, the lore of figures has proven remarkably persistent and sometimes surprisingly lively. Classical authors such as Cicero, Quintilian and Longinus deal with figures at length and in ways that raise important issues about the relationship between language and thought and between theory and practice in the language arts. This tradition continues through the Middles Ages (e.g., Bede and Geoffrey de Vinsauf), the Renaissance (e.g., Erasmus and Peacham), and extends to the present both in systematic treatments (e.g., Lausberg and Dupriez and Halsall) and in less technical variants (e.g., Lanham and Quinn).

Contemporary scholars have become increasingly sceptical about defining tropes or figures as 'deviations' or 'alterations'. Fahnestock (1999) offers a systematic critique of this view and proposes to replace it with a functional conception of a figure as a verbal condensation of an argumentative strategy – an epitome of some line of reasoning that constitutes an argument and is capable of being 'expressed at greater length' (1999: 24). This position not only alters received ideas about the nature of figures but also rejects conventional dichotomies between argument and style. Grounding her position in a revisionist view of the rhetorical tradition, Fahnestock claims to revive concepts embedded in that tradition but disguised or distorted because of modern interpretations. Other scholars have implicitly or explicitly circumvented the tradition and appropriated contemporary theory. Thus, for example, some rhetoricians have used the cognitive theory of metaphor, stemming from the work of Lakoff and Johnson (1980) to uncover basic sources of rhetorical invention in texts or controversies, while others have adopted insights from deconstruction in order to foreground the tropological strategies that govern argumentation.

The second major division of ornamentation is word arrangement, which includes syntax and **prose rhythm**. Prose rhythm was considered important by many classical writers and was treated in depth by Cicero in his *Orator*. It continued to have some place in rhetorical education through the nineteenth century but now receives little attention. The **rhetoric of syntax** describes and considers the effect of loose, paratactic, and complex or periodic sentence constructions. These matters remain of interest to historians of rhetoric and to some rhetorical critics, but the best contemporary account appears in the work of the linguists Leech and Short (1981: 209–54).

Propriety, the fourth virtue of style, has an ambiguous status. It is sometimes treated as a technical concern that yields precepts about accommodating to the subject or occasion – e.g., do not use elevated language when talking about something mundane. But propriety also may assume a central, regulative function for rhetoric.

In this larger sense, propriety works both as a principle for coordinating the internal parts of a discourse so that they cohere and as the guide for accommodating the entire discourse to the audience and occasion in a manner that suits the rhetor's purpose. Propriety, then, functions as the agent mediating between the intrinsic and extrinsic dimensions of rhetoric much in the same way that plot in Aristotle's *Poetics* structures and accommodates the other elements of poetics so that the work can effect *catharsis*, the extrinsic goal of the art.

Arrangement

Arrangement deals with the division and ordering of the parts of discourse. It is an enduring aspect of rhetorical pedagogy that emerges at a very early point in the history of Greek rhetoric and remains important, for example, in modern composition and public speaking textbooks. Throughout this long history, the concept has encompassed both a system of normative precepts and a strategic dimension.

Normative **taxonomies of arrangement** – i.e. schemes that suggest what parts every discourse should have and how these parts should be ordered – allow for the indeterminate dimensions of any situation to come into focus and may aid in the process of invention by offering heuristic prompts. Aristotle presents the most basic version of this taxonomy when he divides the oration into four parts – introduction, narration, proof and conclusion. Other rhetoricians increase the number and internal complexity of these parts and offer detailed guidance about what to say and the proper style for saying it in each of the parts. These taxonomies are sometimes used in conjunction with or instead of the five offices of rhetoric as a means of organising the art.

At the same time, attention to arrangement also opens aesthetically sensitive and strategically oriented considerations about how the emphasis on, interaction between, and sequencing of the parts of a discourse affect its internal coherence and its likely persuasive effect. These concerns are especially prominent in Isocrates and Cicero, since they become connected with the flexible, regulative principle of decorum and with the rhetorical imperative to adjust form and content into a whole that responds appropriately to a particular situation.

Rhetoric's traditional stress on the interplay between arrangement, effect, and context allows for extensions that reach beyond its original scope. For example, from a hermeneutic perspective, Kenneth Burke's (1969) conception of the relation between sequential form and the arousal, frustration and fulfilment of an audience's desires allows not only for a renewed interest in the relationship between form and persuasive effect but also for the introduction of psychoanalytic concepts into this process. The concept of arrangement also chimes with notions developed in structural linguistics on the importance of syntagmatic patterns across larger samples of discourse. And, in the emerging fields of digital and visual rhetoric, arrangement assumes renewed significance, because as the materials for persuasion become more diverse, new problems arise concerning their proper arrangement within different media and in light of combinations of verbal, visual, and sonic stimuli.

Delivery

Delivery draws attention to the embodied and performative dimensions of rhetoric. This focus on the materiality of rhetorical performance endures from the emphasis on voice and bodily movement in early treatises to more contemporary concerns with the effect of new media technologies (i.e. new forms of delivery) on the nature of persuasion.

The earliest **pedagogies of rhetoric** required students to imitate the delivery of actual speeches, but although Aristotle judged that delivery affects the success of a speech greatly, he claimed that it had been neglected in the earlier rhetorical handbooks. He suggested that the **components of delivery** were volume, pitch, and delivery, and Hellenistic scholars appropriated and elaborated on these divisions. In the earliest Latin rhetoric, the *Rhetorica ad Herennium* (probably composed in the early first century BC), we find a fully developed and systematic account of the subject. The anonymous author of this treatise divided delivery into voice and bodily movement. **Vocal quality** entailed volume control, strength or durability of the voice, and flexibility, the capacity

to match tone to the occasion and subject. **Physical movement** had two components – facial expression and gesture. Cicero and Quintilian presented somewhat more elaborate and sophisticated versions of this system.

In the post-classical era, the decline of oratory and the greater emphasis placed on written communication diminished the importance of delivery, and it was not until the **elocution movement** in eighteenth-century Britain that delivery again became a matter of intense focus. Among the more important works associated with that movement were Thomas Sheridan's *Lectures on Elocution*, which offered political and pedagogical reasons for a revival of training in oral performance, and Gilbert Austin's *Chironmia* which used a series of intricate notations to specify the appropriate pairing of physical gesture with vocal delivery.

In twentieth and twenty-first century rhetorical studies, attention to delivery has broadened in scope as scholars inquire into how television and other visual media change the dynamics of contemporary speech-making and the standards for effective oral presentation. Furthermore, as concepts of material culture and the performativity of identity are increasingly applied to the study of discourse, a renewed emphasis on voice, body, and gesture has emerged. Thus, delivery, which the Greek orator Demosthenes reportedly called the first, second, and third most important aspect of oratory, remains an important constituent of rhetoric as it evolves to accommodate changing cultural and technological conditions and to open new paths of inquiry.

M. L. and A. d. V.

Suggestions for further reading

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S

Semantics

Semantics is the study of meaning. In contemporary linguistics, it has generally taken the form of a *theory of truth*, which borrows its technical tools from mathematical logic. This connection between meaning and truth is motivated by the observation that a speaker who knows the meaning of a sentence knows, at the very least, under what conditions it is true or false. To put it differently, if we provide any speaker with a syntactically well-formed sentence *S*, together with a sufficiently detailed situation (i.e. a description of the way the world is), the speaker should in principle be in a position to determine whether *S* is true or false. It is clear that speakers have this ability for infinitely many distinct sentences and situations, which they could not all have memorised. Therefore they must have access to certain **rules** that allow them to compute the truth conditions of complex sentences on the basis of memorised facts about their smallest component parts. **Lexical semantics** is concerned with the meaning of these smallest parts – words or morphemes. In this chapter I will be concerned with **compositional semantic**, which seeks to uncover the rules by which complex meanings can be formed.

Meaning and truth

By its very nature, semantics establishes a relation between well-formed sentences and the world. An older tradition viewed semantics as translational in nature. The idea was that sentences are interpreted by way of **translation**, typically into a '**language of thought**'. The problem, however, is that such a translational approach does not explain how speakers have knowledge of truth conditions, *unless* some semantic rules have already been provided for the language of thought. It is in the end an empirical question whether such a translational process is indeed at work in the speaker's mind. But what is clear is that at some point some (non-translational) semantic rules must be provided to relate (some) language to the facts of the world. In the following paragraphs I will follow much contemporary research in taking these rules to be specified for some level of syntactic representation of natural language sentences (rather than for a hypothetical language of thought).

To obtain explicit and predictive theories, semantics has generally borrowed its technical tools from mathematical logic. This is a somewhat ironic historical development; for modern **logic** was viewed by many of its pioneers as a way to *redress* the shortcomings of natural language, which was deemed too vague and ambiguous to be suitable for complex scientific argumentation. But after formal languages were studied with great rigor in the first half of the twentieth century, two pioneers of modern linguistics had the idea of treating English (or for that matter other natural languages) as if it were a formal language: Noam Chomsky created the field of formal syntax in the 1950s, while Richard Montague founded '**modeltheoretic semantics**' in the 1960s (the name 'modeltheoretic' comes from a branch of logic that studies the interpretation of formal languages). Montague built on key insights of the Polish logician Alfred Tarski, who had shown in the first half of the century how to give a rigorous

definition of truth for formal languages. As soon as English was itself treated as a formal language, it became natural to extend Tarski's programme to natural language so as to account for meaning. Chomsky and Montague both engaged in a kind of 'reverse engineering': instead of stipulating formal languages whose syntactic or semantic properties they then studied, they started from the observed properties of English sentences and tried to infer by which syntactic or semantic rules they were created. The Chomskyan and the Montagovian traditions were largely unified in the 1980s and 1990s with the advent of rigorous studies of the **syntax/semantics interface**. Both traditions contributed to a broad investigation of the universal properties of language, its parameters of variation, its acquisition by children, its impairment after brain lesions, and more generally of its implementation in the brain. Gradually, then, formal semantics has become integrated into the general programme of cognitive science – a development which is only at its early stages.

Minimally, a **semantic theory** should specify rules by which the truth conditions of complex sentences are computed on the basis of memorised properties of words or morphemes, together with a specification of the syntax (derivation tree) of the sentence at hand. Semantic theories must thus satisfy the following condition:

(1) The meaning of any expression is determined from the meaning of its smallest parts and the way they are put together.

Often, however, semanticists have attempted to meet a more stringent requirement, which demands that the meaning of a sentence be determined by the meaning of its *immediate* parts and the way they are put together. For example, the sentence *[Mary [saw John]]* has two immediate parts, the Noun Phrase *Mary* and the Verb Phrase *saw John;* but it contains three ultimate (or 'smallest') parts, *Mary*, *saw* and *John*.

This has the effect of limiting the information accessible to semantic rules. This principle, which has been the object of sophisticated formal discussions, is called the **Principle of (Strong) Compositionality**, stated in (2) (the principle in (1) is sometimes called the **Principle of Weak Compositionality**):

(2) The meaning of any expression is determined from the meaning of its *immediate* parts and the way they are put together.

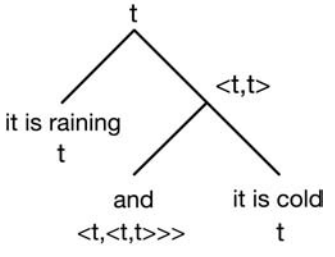
Contemporary semanticists often implement their theories within an even more stringent framework, called **type theory**, in which the meaning of any complex expression is obtained by applying the meaning of one of its immediate parts, seen as a function, to the meaning of its other immediate part, seen as argument. While it is by no means the only possible framework for semantics, it has the advantage of brevity, and is thus worth discussing in greater detail. Type theory is developed by choosing an inventory of elementary types, which are sets of objects of a particular sort – for instance, one generally takes t to be the type of truth values, assimilated to {0, 1} (with the convention that 0 represents falsity, and 1 represents truth); and e is the type of individuals, assimilated to a domain D of objects such as persons, things, etc. From elementary types, one builds complex types recursively, using the following rule:

(3) If τ_1 and τ_2 are types, $<\tau_1\ \tau_2>$ is a type.

(Notational variant: one also sees the notation $\tau_1 \rightarrow \tau_2$ for $<\tau_1\ \tau_2>$.) $<\tau_1\ \tau_2>$ is intended to denote the set of functions that take objects of type τ_1 as input and return objects of type τ_2 as outputs. In the simplest framework, *it is raining* has type t (because a clause has a truth value), while the meaning of negation (for instance the expression *it's not the case that*, analysed for simplicity as a single lexical item) is an example of a function of type <t, t>: it takes a clause, of type t, as argument, and forms with it another clause, which also has type t. The case of conjunction is more interesting. When one studies formal languages, one can perfectly well decide that *F and G* is a well-formed formula, which has truth conditions that are specified by a logical rule, but that *and G* on its own has no meaning. But syntacticians have often argued that in English *[F [and G]]* – for instance *[it is raining [and it is cold]]* has an asymmetric structure, in which *and G* forms a natural unit, called a 'constituent'. When this assumption is adopted, the type-theoretic framework makes it possible to assign a meaning to *and G*: it is a function that takes a truth value as

argument (in our example, the value of *F*) and returns a truth value as output (in our example, the truth value of the entire conjunction *[F [and G]]*); in other words, it is a function of type <t, t>. From this, we can infer that *and* must itself have a meaning of type <t, <t, t>>: it takes as argument a function of type t (here, the meaning of *G*) and returns a function of type <t, t>, as is summarised in the derivation tree in (4), in which each constituent is annotated with its type.

(4)



The type-theoretic approach can in principle be applied to all other expressions. For instance, proper names are plausibly taken to denote individuals, and they are thus of type e. What about intransitive predicates (e.g., intransitive verb phrases)? Well, they combine with object-denoting expressions to produce truth values; so they must denote functions of type <e, t>: the latter take as argument an individual, and return a truth value. The same analysis can be applied to transitive verb phrases: *saw John* can be seen as an intransitive predicate, so it is of type <e, t> . Since *John* is of type e, it follows that *saw* is of type <e, <e, t>>. This analysis is generally extended to noun phrases as well, with the (considerably slimmer) argument that one can say things like *John is Dean*, and that *be* is plausibly vacuous semantically.

(5) Some types of common expressions:

a. Clauses	it-is-raining	t
b. Proper names	John	e
c. Intransitive verb phrases	smokes	<e, t>
d. Noun phrases	Dean	<e, t>
e. Transitive verb phrases	saw	<e,<e, t>>
f. Negation	not, it-is-not-the-case-that	<t, t>
g. Conjunction and disjunction	and, or	<t,<t, t>>

Of course types only specify the sort of function denoted by each expression; to obtain truth conditions, we need to specify the *precise* function in question. One often writes the denotation of an expression *E* as [[E]]. Using this convention, we can for instance posit the following lexical entries, where we define functions explicitly using arrows (we assume that there are two individuals in the domain of discourse, j and m):

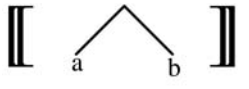
(6) [[John]] = j, [[Mary]] = m

$$[[\text{smokes}]] = \begin{bmatrix} j \rightarrow 1 \\ m \rightarrow 0 \end{bmatrix}$$

$$[[\text{drinks}]] = \begin{bmatrix} j \rightarrow 0 \\ m \rightarrow 0 \end{bmatrix}$$

To these lexical entries, we can add a unique rule, called **function application**, which specifies how any binary subtree (i.e. any subtree with two immediate parts) should be interpreted:

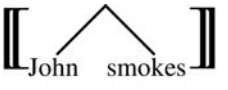
(7)



= [[a]] ([[b]]) or [[b]]([[a]]), whichever one is admissible given the rules of type theory

This makes it possible to compute the value of *John smokes*, which turns out to be true:

(8)



= [[smokes]] ([[John]])

$$= \begin{bmatrix} j \rightarrow 1 \\ m \rightarrow 0 \end{bmatrix} (j) = 1$$

Importantly, it is **derivation trees** produced by the syntax rather than strings of words that

must be interpreted. This is essential to deal with structurally ambiguous sentences, i.e. sentences that can be assigned distinct structures, as is illustrated in (9):

(9) It will rain and it will be cold or it will be windy.
   a. Reading 1: [It will rain and [it will be cold or it will be windy]]
   b. Reading 2: [[It will rain and it will be cold] or it will be windy]

The sentence is ambiguous: on Reading 1, it entails that it will rain; on Reading 2, it does not. If the input to the semantic component were a string of words without structure, we just would not know which truth conditions to assign to this sentence. The problem disappears if derivation trees rather than strings are the input to semantic interpretation.

With this framework in place, we can ask the basic questions of semantics:

- What are the primitive objects that must be postulated to interpret sentences? All standard semantics posit a domain of individuals, and some truth values. But the nature of the truth values is already a matter of debate: besides *true* and *false*, some add a third truth value, #, to handle certain cases of semantic failure (see below). Furthermore, beyond the individual domain, some researchers posit times and so-called **possible worlds**, some posit events or situations, and some posit a combination of those. I survey some of these possibilities below.
- What are the rules of interpretation? In the simplest type-theoretic framework, there is a single rule of interpretation, function application, defined in (7) above. Typically, however, such a system needs to be supplemented with additional semantic rules, which are often of a different nature; I will give some examples of this sort below.
- How does semantics interact with other modules of the mind – especially syntax and pragmatics? The latter question is by no means trivial. In many cases, the data studied by the linguist could be analysed along syntactic, semantic or pragmatic lines. To take an example, there are at least three ways in which one could explain why the examples in (10) are odd:

(10) a. #John is pregnant.
   b. #An idea is sleeping.

First, one could claim that the deviance is *syntactic*, because predicates come in the syntax with conditions on the features of their subjects (so-called **sub-categorisation frames**). Thus *John is pregnant* might be deviant because *pregnant* requires a subject with +feminine features, whereas *John* is masculine. Similarly, *An idea is sleeping* might be ungrammatical because *sleeping* demands a subject with +animate features, which is not the case of the noun phrase *idea*. An alternative account is to take the deviance to be purely semantic in nature. According to this analysis, there are not two but three truth values: 1, 0 and # – the latter of which encodes semantic failure. Under this view, the function denoted by *be pregnant* yields the value # when it is applied to an argument which is not female. Finally, we could take these sentences to be pragmatically deviant, in the sense that general rules of communicative exchange make them infelicitous; for instance, one could posit that these statements are semantically false, but that they are *trivially* so, and hence systematically uninformative and thus useless. I leave this question open, but we will encounter below several other cases in which the precise boundary between syntax, semantics and pragmatics is a topic of considerable contemporary interest.

Individuals: quantifiers and pronouns

The *lingua franca* of semantics is the theory of pronouns and quantifiers, which is easiest to develop with respect to individual talk, although it turns out to have important applications beyond it.

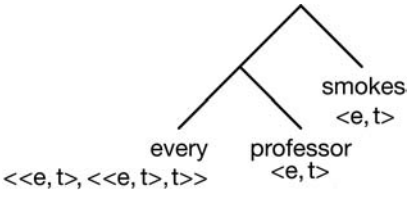
Quantifiers

Let us start with quantifiers, i.e. expressions such as *some student*, *every professor*, *most Frenchmen*, etc. A crucial insight, due to the German philosopher Frege, was that quantifiers are 'second-order properties': they do not denote objects, but rather they say something about the extension of

a predicate. For instance, *A student is sick* says that the extension of the predicate *is sick* contains a student; similarly, *Every professor is sick* says that the extension of *is sick* contains every professor. Frege's logic was primarily intended as a tool to study mathematics. It gave rise, among others, to first-order logic, which includes the universal quantifier ∀ and the existential quantifier ∃, as in the formulas ∀*x S(x)* and ∃*x S(x)* (the logic is called 'first-order' because the quantifiers range over individuals, not over properties of individuals). But there are two crucial respects in which natural language quantifiers differ from these. First, natural language quantifiers are *restricted:* even if we read *S(x)* as *x is sick*, the formula ∀*x S(x)* ends up making a claim about every object in the universe of discourse, whereas the sentence *Every student is sick* only makes a claim about *students*; in other words, to evaluate the truth of the claim, we may restrict attention to those individuals in the universe that are students. But there is a second respect in which natural language quantifiers differ from their counterparts in logic: they include a variety of numerical quantifiers which do not exist in first-order logic, and furthermore could not even be defined within it. For instance, *most professors are sick* is a statement whose truth conditions could not be defined even if we gave ourselves all of first-order logic, together with a predicate *P* for *professor* and a predicate *S* for sick (in fact, a stronger result holds – undefinability would still hold if we gave ourselves an unrestricted quantifier *most things in the universe*).

Semanticists have thus generalised the notion of quantifier used in logic to handle these cases. To do so within the type-theoretic framework which was sketched above, we can reason as follows: *professor* and *smoke* are both expressions of type <e, t>. The syntax of *every professor smokes* suggests that *every professor* is a syntactic constituent, as is *smokes*, of course. For the sentence to return a truth value, *every professor* must have type <<e, t>, t>: it takes a predicative expression as an argument (here: *smokes*, of type <e, t>), and returns a truth value. This can be seen to implement Frege's intuition that quantifiers are predicates of predicates: if we write P = <e, t> for the type of predicates, we see that *every professor* has type <P, t> – which is analogous to the type <e, t> of intransitive predicates, except that the type of individuals e has been replaced with the type P of predicates. Going one step further, this means that *every* must itself have the complex type <<e, t>, <<e, t>, t> , which we can write more legibly as <P, <P, t>>. In effect, we can view *every* (also called a **generalised quantifier**, or less ambiguously a '**determiner**') as a transitive predicate of properties (just like *see* was a transitive predicate of individuals, of type <e, <e, t>>). This is illustrated in (11).

(11)



Let us now call EVERY, A, MOST, etc. the denotations of the relevant determiners, for which we will now provide truth conditions. For perspicuity, we assimilate PROFESSOR and SMOKE, which are technically functions from individuals to truth values, to sets – the set of individuals that are professors or smokers, respectively. Writing ^{C}SMOKE for the complement of SMOKE, i.e. the set of non-smokers, and using | … | to refer to the size of a set, we can give the following truth conditions ('iff' abbreviates 'if and only if', and ∩ represents set-theoretic intersection):

(12) a. (EVERY(PROFESSOR))(SMOKE) = 1 iff |PROFESSOR ∩ ^{C}SMOKE| = 0
b. (A(PROFESSOR))(SMOKE) = 1 iff |PROFESSOR ∩ SMOKE| ≥ 1
c. (NO(PROFESSOR))(SMOKE) = 1 iff |PROFESSOR ∩ SMOKE| = 0.
d. (MOST(PROFESSOR))(SMOKE) = 1 iff |PROFESSOR ∩ SMOKE| > |PROFESSOR ∩ ^{C}SMOKE|
e. (AT LEAST THREE(PROFESSOR))(SMOKE) = 1 iff |PROFESSOR ∩ SMOKE| ≥ 3
f. (FEWER THAN SEVEN(PROFESSOR))(SMOKE) = 1 iff |PROFESSOR ∩ SMOKE| < 7

g. (EXACTLY FIVE(PROFESSOR))(SMOKE) = 1 iff |PROFESSOR ∩ SMOKE| = 5

To take an example, (12)a means that (EVERY (PROFESSOR))(SMOKE) has value 1 (for 'true') just in case the intersection of the set of professors with the set of non-smokers has size 0 – in other words, all the professors are smokers. Similarly, (12)d means that (MOST (PROFESSOR))(SMOKE) has value 1 just in case the number of professors who smoke is greater than the number of professors who do not smoke – which seems like a reasonable approximation of the meaning of this determiner.

With this framework in mind, it is natural to ask which determiner meanings are instantiated in the world's languages. Researchers have found that several semantic constraints are generally satisfied. Two are worth mentioning:

- Natural language determiners are *numerical:* they only 'count' elements that satisfy certain properties (here: PROFESSOR and SMOKE), without discriminating on the basis of their particular identity. So there is no determiner that could crucially depend on the fact that, say, John as opposed to Bill is a professor.[1] In the lexical entries in (12), this property is reflected by the fact that it is only the size of certain sets that matters, and not the particular objects they contain.
- Natural language determiners are *conservative:* they only 'care' about those individuals that satisfy their nominal argument. So for instance to determine whether *most professors smoke*, we only need to consider individuals that are professors, and do not need to worry about non-professors. To be more precise, *most* is conservative because no matter who the professors and who the smokers are, *no professor smokes* is true just in case *no professor is a professor that smokes*: in evaluating the verbal argument of *no*, we can repeat the nominal argument without modifying the truth conditions. (Conservativity is a constraint that certainly has some 'bite': one could plausibly analyse *only* as a determiner that fails to obey it, because to check whether it is true that *only professors smoke* we definitely have to check whether some non-professors do (as a result, *only professors are professors that smoke* does not have the same truth conditions as *only professors smoke*). So *if* the word *only* were a determiner, it would not be conservative. As it turns out, the syntactic distribution of *only* strongly suggests that it is not a determiner, as witnessed by the fact that it can appear in a variety of environments in which determiners never show up (for instance right before predicates, as in *John is only sick, he isn't dying*).)

The semantic study of natural language determiners (or 'generalised quantifiers') has led to important insights about phenomena that had traditionally been treated in syntactic terms. One celebrated example concerns the licensing of Negative Polarity Items such as *ever*, *any*, *at all*, which in simple examples require a negative expression to license them:

(13) a. John has been to Paris.
b. John hasn't ever been to Paris.
c. *A tourist who has been to France has ever been to Paris.
d. *A tourist who has ever been to France has been to Paris.
e. No tourist who has been to France has ever been to Biviers.
f. No tourist who has ever been to France has been to Biviers.
g. *Every tourist who has been to France has ever been to Paris.
h. Every tourist who has ever been to France has been to Paris.

(13)a–b are the initial motivation for positing that *ever* must stand in a close relation to a negative element (a plausible assumption, advocated in syntax, is that *ever* must be 'c-commanded by' a negative element; or to use terms more common in logic, it must be 'in the scope of' a negative element). This hypothesis gains further support from the deviance of (13)c–d and the acceptability of (13)e–f. But then the contrast in (13)g–h comes as a surprise: no negative element appears in the sentence, and yet *ever* is licensed when it is embedded in the nominal argument of *every*, but not in its verbal argument. Why? The answer, due to Ladusaw (1979) and Fauconnier (1975), is that the constraint on the distribution

of *ever* is semantic in nature: *ever* is acceptable just in case it appears in an environment which is semantically negative. **Semantically negative environments** are defined in terms of entailment (for this reason, they are also called 'downward-entailing'): if John doesn't have a property P, *a fortiori* he doesn't have any stronger property P'; for instance, if John hasn't been to France, *a fortiori* he hasn't been to southern France. By contrast, if John has been to France, it does not follow that he has been to southern France. It can be checked that the data in (13)a–f follow from this characterisation. But now the facts in (13)g–h follow as well, because *every* creates a negative environment in its nominal but not in its verbal argument. This can be seen by observing that *every tourist who has been to France has been to Paris* entails that *every tourist who has been to southern France has been to Paris*. By contrast, the same sentence does not entail that *every tourist who has been to France has been to the 20th district of Paris*. Thus the licensing of negative polarity items can fruitfully be stated in semantic rather than syntactic terms. Of course this still fails to explain *why* some words should be sensitive to this particular semantic property; this is still a topic of ongoing research.

In the case of negative polarity items, the theory could have been developed entirely in terms of entailment. In other cases, however, generalised quantifier theory is essential to provide adequate generalisations. This is the case of another puzzle, which concerns the surprising patterns of acceptability produced by the existential *there*-construction:

(14) a. *There is every problem.
b. There is a problem.
c. There is no problem.
d. *There are most problems.
e. There are at least three problems.
f. There are exactly five problems.

A highly successful account of this distribution relies on the hypothesis that the *there*-construction is only acceptable when the determiner that comes at the tail of the construction is 'symmetric' with respect to its nominal and verbal arguments. Let us consider the determiner *a: A professor smokes* has the same truth conditions as *A smoker is a professor*. Similarly for *No professor smokes*, which means the same thing as *No smoker is a professor*. We say that the determiners *a* and *no* are symmetric because their nominal and verbal arguments can be reversed with no truth-conditional change. By contrast, *Every professor smokes* does not mean the same thing at all as *Every smoker is a professor*. By going back to the lexical rules in (12), it can be checked that *a*, *no*, *at least three*, *less than seven* and *exactly five* are the only determiners in the list that are symmetric, in the sense that their two arguments can be reversed without change (this can be ascertained by observing that in each case they only make claims about the size of PROFESSOR ∩ SMOKE, which is of course the same thing as SMOKE ∩ PROFESSOR). This generalisation nicely accounts for our data, and here too it is essential that grammatical constraints can be stated in purely semantic terms.

It should be added, however, that the theory of generalised quantifiers as defined only treats part of the logical complexities of natural language. A very rich domain is offered by the analysis of plurals, which give rise to numerous problems that are the object of intense contemporary research.[2]

Pronouns and binding

Let us turn to pronouns. While their analysis is still a topic of considerable debate, the theory that serves as a focal point treats pronouns as variables in predicate logic: pronouns that are 'free' (i.e. do not have an antecedent) are a sort of 'temporary proper names', whose denotation is provided by an assignment function. Technically, the semantic rules we posited earlier are now relativised to an assignment function s, which assigns objects to variables x_1, x_2, x_3, etc. And we add a special rule for pronouns, which says that the denotation of a pronoun pro_i carrying an index i is whatever the assignment function s assigns to x_i (for words which are not pronouns, the rules we posited earlier in (6) and (7) remain unchanged, except that for uniformity the superscript *s* is added everywhere):

(15) $[[\text{pro}_i]]^s = s(x_i)$

Our theory is still insufficient, however, because there are numerous constructions in which

pronouns have *variable reference*, and do not denote just one given individual. This is for instance the case in the sentences *Every professor admires himself* or *Every professor likes people who admire him*, where *himself* must and *him* can be construed as having 'every professor' as its antecedent; we say in this case that they are 'bound' (which is the opposite of being 'free'). For simplicity, we stick to the first example (but the second example shows that the difficulty is not limited to reflexive pronouns). The solution is to take the quantifier to be responsible for the formation of a complex predicate, λ*i i admires himself*$_i$, which can be paraphrased as: *is an i such that i admires i.* Thus the sentence in (16)a is taken to have the structure in (16)b, where t_i is a pronoun-like element (called in syntax the **trace** of the quantifier) and λ*i* is called a **λ-abstractor**, whose purpose is to form a complex predicate:

(16) a. Every professor admires himself.
b. [Every professor] [λi t_i admires himself$_i$]

Intuitively, then, (16)a means that every professor has the property of *being an individual i such that i admires i.* All we need to do to incorporate this view into the analysis of quantifiers developed above is to ensure that the expression *λi* t_i *admires himself*$_i$ has the semantic type of an intransitive predicate, i.e. <e, t>. This is achieved by defining a special rule that guarantees that λ*i* t_i *admires himself*$_i$ denotes that function which associates to any individual d the value 1 just in case d admires d. Technically, we define f in such a way that for every object x, f(x) has the value of t_i *admires himself*$_i$, evaluated under a modified assignment function that assigns *x* to index i. If we write s[i → x] for an assignment function that fully agrees with s, except that it assigns x to i, the rule can be defined as in (17):

(17) $[[\lambda i\ F]]^s$ = that function f of type <e, t> such that for all x, f(x) = $[[F]]^{s[i \rightarrow x]}$

The syntax-semantics interface

The semantic analysis we have sketched is intimately related to questions that concern the syntax/semantics interface, i.e. the delineation of the precise boundary between syntax and semantics.

First, syntacticians have long known that the analysis of pronouns must be constrained. Thus *John likes him* cannot mean that John likes John; but nothing in what we said precludes a situation in which the sentence *John likes him*$_i$ is interpreted under an assignment function s which assigns John to the pronoun *him*$_i$. The problem can be solved in two ways: by adding syntactic constraints on the distribution of indices, so that *John likes him*$_i$ comes out as *syntactically* ill-formed under certain conditions (this is the line followed by Chomsky in his **binding theory**); alternatively, we could revise the semantics so as to predict that such an interpretation cannot be obtained in the first place. The debate between the two approaches, which should be settled on empirical grounds, is the object of ongoing research on the syntax/semantics interface.

Second, the semantic analysis of quantifiers interacts in interesting ways with sophisticated questions of syntax. Quantifiers often give rise to ambiguities that appear to be structural, i.e. to be due to the structure of the sentences at hand, as seen in (18):

(18) a. A doctor will interview every new patient.
b. [a doctor] λi [every new patient] λk t_i will interview t_k
c. [every new patient] λk [a doctor] λi t_i will interview t_k

(18)a can be understood to make the strong claim that there is some doctor that will interview every new patient, as is represented in (18)b; or it can be understood to make the weaker claim that for every new patient, there is a (possibly different) doctor that will talk to him, as is represented in (18)c. Why is there such an ambiguity? A bold view would be that the sentence really *does* have two possible syntactic representations, which literally correspond to (18)b and (18)c. Precisely this claim has been made in studies of 'Logical Form' within generative syntax. The view is emphatically not that the *only* way to account for the ambiguity is to posit that quantifiers appear in a position different from the one in which they are pronounced; such a view is certainly incorrect, as there are sophisticated semantic proposals that predict an ambiguity *without* resorting to such abstract levels

of syntactic representation (the debate is still entirely open). Rather, the claim is that there is independent evidence for operations of movement that predict the right data when they are extended to quantifiers.

In the case at hand, the argument is in two steps. First, it has been argued in syntactic theory that certain expressions, such as interrogative words, are generated in a certain position but then 'move' to the location in which they are pronounced, leaving behind a 'trace' in their original position (the expression and the trace are co-indexed to indicate in complex examples which trace corresponds to which expression):

(19) a. [Which patients]$_i$ will a doctor interview t_i?
b. [Which patients]$_i$ will a doctor try to assist t_i personally? (Reinhart 1998)

Importantly, this movement is not possible out of all positions; certain syntactic configurations are **islands** because interrogative words cannot move out of them. For instance, an interrogative word cannot be moved out of a complex Noun Phrase (*the possibility that* …), as is illustrated by (20)a; similarly, interrogative words cannot move out of an *if*-clause, as shown in (20)b:

(20) a. *Which patients will a doctor examine [the possibility [that we give t_i a tranquiliser]]?
b. *Which patients should a doctor worry [if we sedate t_i]? (Reinhart 1998)

Now the crucial observation is that if we posit that the ambiguity observed in (18) is the result of an invisible (or 'covert') movement operation, which takes place *after* a sentence is pronounced rather than before, we predict, correctly, that some readings should disappear when one of the quantifiers is embedded within a syntactic island. This appears to be correct:

(21) a. A doctor will interview every new patient.
OK Reading 1: [a doctor]$_1$ [every patient]$_2$ t_1 will interview t_2.
OK Reading 2: [every patient]$_2$ [a doctor]$_1$ t_1 will interview t_2.
b. A doctor will try to assist every new patient personally.
OK Reading 1: [a doctor]$_1$ [every patient]$_2$ t_1 will try to assist t_2 personally.
OK Reading 2: [every patient]$_2$ [a doctor]$_1$ t_1 will personally t_2 personally.
a'. A doctor will examine the possibility that we give every new patient a tranquiliser.
OK Reading 1: [a doctor]$_1$ t_1 will examine the possibility that [every patient]$_2$ we give t_2 a tranquiliser.
* Reading 2: [every patient]$_2$ [a doctor]$_1$ t_1 will examine the possibility that we give t_2 a tranquiliser.
b'. A doctor should worry if we sedate every new patient
OK Reading 1: [a doctor]$_1$ t_1 should worry [if [every patient]$_2$ we sedate t_2]
*Reading 2: [every patient]$_2$ [a doctor]$_1$ t_1 should worry [if we sedate t_2] (Reinhart 1998)

These data can then be explained with minimal semantic effort if we recast the relations between traces and quantifiers in terms of the creation of complex predicates illustrated in (16), so that the syntactician's representations in (21)a are minimally revised to look more like (18) (alternatively, slightly different semantic rules may be posited to apply directly to (21)a). In this way (which is just one example of one possible explanation), syntactic and semantic considerations conspire to predict intricate patterns of interpretation.[3]

Beyond individuals: contexts, times, possible worlds, events

Beyond individuals, several other types of objects must be integrated into semantic theory if it is to have any plausibility. Which types of objects must be posited is a subject of debate, but we will briefly consider contexts, times, possible worlds, and events.

Contexts

Expressions such as *I* (or *you*), *here* and *now* denote individuals, locations and times which depend on the context of utterance: *I* uttered by

John does not refer to the same individual as *I* uttered by Mary. Since it does not seem that John and Mary speak different languages, it is useful to relativise the interpretation of sentences not just to an assignment function (which was seen to be useful for third person pronouns), but also to a context parameter, written as *c* in what follows. All of our earlier rules can be preserved in this enriched framework, but we can also define rules such as the following:

(22) $[[\text{I}]]^{c,\,s}$ = the speaker of c
$[[\text{you}]]^{c,\,s}$ = the addressee of c

The context parameter turns out to have many applications, among others in tense semantics.[4]

Times

In order to deal with times, one needs some account of tense. Intuitively, *John left* is true when uttered in a context c just in case there is some moment before the time of *c* at which John left. Similarly, *John will leave* is true in *c* just in case there is a moment after the time of *c* at which John leaves.

In the tradition of tense logic, it was thought that linguistic reference to times crucially differs from reference to individuals in that the former is strictly less expressive than the latter. Specifically, it was thought that natural language does not have pronouns that refer to moments, and quantifiers that can bind them, but that it can only make use of **operators** that do both things at once – which makes the system less flexible and expressive than reference to individuals. It was further thought that the present tense is just the absence of a past or future operator. This led to an analysis in which a time parameter *t* is added to the context parameter *c* and to the assignment function *s*. A clause that has no tense is evaluated with respect to *t*, which of course means that the interpretation of *all* expressions must be similarly relativised to times (to be concrete, the verb *smokes* will now denote different functions at different moments, because who the smokers are typically changes over time). As for a clause of the form *PAST S* or *FUT S*, where *PAST* and *FUT* are past and future tense operators, they can be interpreted using the rules in (23):

(23) a. $[[\text{PAST F}]]^{c,\,s,\,t} = 1$ iff for some time t' before t, $[[\text{F}]]^{c,\,s,\,t'} = 1$
b. $[[\text{FUT F}]]^{c,\,s,\,t} = 1$ iff for some time t' after t, $[[\text{F}]]^{c,\,s,\,t'} = 1$

It is straightforward to apply this analysis to the example *John left*, once we specify that the initial value of t is c_t, the time of the context (we follow syntacticians in taking the tense to occur at Logical Form in a position which is to the left of the rest of the sentence):

(24) $[[\text{PAST John leave}]]^{c,\,s,\,c_t} = 1$ iff for some time t' before c_t, $[[\text{John leave}]]^{c,\,s,\,c_t} = 1$, iff for some time t' before the time c_t of c John is leaving at t'

This analysis is simple and attractive, and it can be refined to handle more sophisticated constructions, for instance complex tenses (e.g., the pluperfect), as was done in Reichenbach (1947). But a major finding of contemporary semantics, originally due to Partee (1973), is that this view is largely mistaken. Partee's main insight is that temporal semantics has to a large extent the same resources as individual semantics: tenses often behave like time-denoting pronouns, and they may be bound by quantifiers (which are often unpronounced). There are two important arguments for this analysis: first, the time argument of verbs often behaves like a pronoun; second, nominals, which are semantically predicates, also have time arguments that display a pronominal behaviour.

Let us start with Partee's argument that tense can sometimes be read as a pronoun.

Suppose that a well-known and elderly character is in discussion with his editor who wants to put his picture on his latest book. Looking at the picture, he utters (25)a:

(25) a. I wasn't young.
b. PAST not I be-young
c. not PAST I be-young

The analysis offered by the modal semantics we posited in (23) is inadequate to capture the intended truth conditions, because all it can offer is (25)b or (25)c (this is on the assumption that temporal operators, like quantifiers, can move 'covertly'). But (25)a simply asserts that there was some past moment at which the well-known

character was not young, which is not informative in the case at hand; for its part, (25)b asserts that there was no moment in the past at which the character was young, which is certainly false. Neither of those readings is what the character has in mind; rather, he wishes to convey that *at the time made salient by the photograph*, he wasn't young (and he might want to imply that this choice is not optimal). The desired reading is easily obtained by treating the past tense as a time-denoting pronoun, which in this case gets its denotation from an assignment function (duly upgraded so as to assign a value not just to individual but also to time variables). This leads to the representation in (26), where the past tense contributes a time variable i_1 (in a more complete treatment, the tense features themselves would contribute a constraint – often treated as a *presupposition* – on the value of that variable):

(26) not i_1 I be-young

Partee shows in detail that several other uses of pronouns have counterparts in the temporal domain as well, but for simplicity we disregard this part of the argument.

Interestingly, a related point was made by Enç (1987) about nominals, which she argued must be endowed with time variables that are allowed to refer autonomously. A famous example involves the noun *fugitives* in (27)a:

(27) a. The fugitives are in jail.
b. i_0 the [i_1 fugitives] be-in-jail

Enç's point is that this sentence does not mean that the people who are *currently* fugitives are now in jail, as would be predicted by a simple tense logic; this only has a contradictory reading. Rather, the sentence is understood to mean that *the individuals who were fugitives at a salient time* i_1 are now in jail. In our revised view of tense, the present tense will itself contribute a time variable i_0, which must be constrained (by a different part of the theory) to denote the time of utterance. Together, i_0 and i_1 give rise to the desired reading, in which *the individuals that were fugitives at time* i_1 *are in jail at time* i_0.

By separating the role played by time quantifiers from that of time variables, this analysis endows natural language with more flexibility than is afforded by tense logic. This has important consequences for the syntax/semantics interface, because we obtain in this way a variety of readings that would be very hard to get with basic temporal operators. A simple example is provided in (28) (more sophisticated examples are offered in Cresswell 1990):

(28) a. Some day, all of Dominique's students will be on the Editorial Board of *Linguistic Inquiry* (and he will rule syntax!)
b. Wrong Analysis 1: [all students] λ1 FUT t_1 be-on-the-EB
c. Wrong Analysis 2: FUT [all students] λ1 t_1 be-on-the-EB

The intended reading is one on which there is some day D in the future such that at D all of Dominique's current students are on the Editorial Board at D (with the addition of *it will happen that*, this may be the only available reading). Within a framework that only countenances temporal operators, this gives rise to a **scope paradox**:

- For the truth conditions to come out right, the quantifier *all of Dominique's students* must be in the scope of the time operator *some day;*
- But this has the consequence that *student* is evaluated with respect to a non-present moment;
- despite the fact that on the intended reading *students* means: *current students*.

The paradox can be solved if we posit time variables, as shown by the representation in (29)a, paraphrased as in (29)b:

(29) a. [some i_1: $i_0 < i_1$] [all [i_0 students]] λ2 [i_1 [t_2 be-on-the-EB]]
b. There is some future moment i_1 such that every individual who is a student at the current moment i_0 is on the Editorial Board at i_1

Thus time pronouns are both semantically and syntactically essential for a proper understanding of time dependency in language.

Possible worlds

Just like times are used to provide a semantics for tense, possible worlds have often been used

to provide a semantics for mood and modals, as in *John might come*, or *If John were here, Mary would be happy*. Possible worlds are a topic of controversy in metaphysics, but they have proven helpful to define a semantics for modal logic, which is concerned with reasoning about possibilities; and in turn, modal logic proved initially useful to analyse natural language. In essence, one can think of a possible world as an entity that fully determines the way things are *or could have been.*

Equipped with such a notion, we can further relativise the tense logic we introduced in the previous section to a world parameter – with the convention that the initial value of the world parameter is just the world of the context. This makes it possible to define interpretive rules for sentences of the form *may S* or *must S* (we follow syntacticians in taking the modal to occur at Logical Form in a position which is to the left of the rest of the sentence):

(30) a. [[may S]] $^{c, s, t, w}$ = 1 iff for some world w' accessible from w, [[S]] $^{c, s, t, w'}$ = 1
b. [[must S]] $^{c, s, t, w}$ = 1 iff for every world w' accessible from w, [[S]] $^{c, s, t, w'}$ = 1

Intuitively, one reading of *John may be sick* is that there exists a state of affairs (= a possible world) compatible with what we know in which John is sick. By contrast, *John must be sick* makes the stronger claim that *every* possible world compatible with what we know is one in which John is sick. These truth conditions are easily derived if we take *w' is accessible from w* to mean: *w' is compatible with what is known in w* (at the time of evaluation). With the further specification that the initial values of t and w are the time and world of the context c, respectively, we can derive the desired truth condition:

(31) [[must John be-sick]] $^{c, s, t, w}$ = 1 iff for every world w' compatible with what is known in w at t, [[John leave]] $^{c, s, t, w'}$ = 1, iff for every world w' compatible with what is known in w at t, John is sick in w' at t.

This analysis turns out to have considerable benefits when we consider different *readings* of modals. *John must be sick* means that for all we know he is sick. *John must work* does not mean that in every world compatible with what we know he works, but rather that in every world compatible with moral norms (or some related notion), he works. In these two readings, we see that something remains constant: the quantificational force of *must*, which makes a claim about *every* possible world with certain properties. What changes, on the other hand, is the domain of worlds which is quantified over: in the first case it is the worlds *compatible with what is known*, in the second it is the worlds *compatible with a norm.* The theory can account for this variation by allowing the precise meaning of *accessible* in (30) to be determined by the discourse situation.

Although this analysis has proven quite powerful, it is generally thought that the same arguments that show that tense talk in natural language is richer than tense logic carry over to the world domain. Semanticists now generally work with systems that include explicit world-denoting pronouns, which may be free, or bound by (pronounced or unpronounced) world quantifiers. In fact, almost all of the data we discussed with respect to the tense domain have a counterpart in the world domain, which suggests that the same measures should indeed be applied in both cases.

Events and beyond

Finally, many theories make use of other kinds of objects to handle further constructions.

Some of these objects may be used *in lieu* of times and possible worlds, and there is currently no consensus on the 'right' ontology (and to some extent one can 'translate' among approaches that posit different ontologies).

Events are a particularly useful category, which was initially posited by the philosopher Davidson to account for the logic of adverbial modification, which is not easily handled in the simple analysis of verbs (analysed as expressions of type <e, t>) which was sketched above. His basic observation was that *Brutus stabbed Caesar at midnight with a knife* entails that *Brutus stabbed Caesar* and that *Brutus stabbed Caesar with a knife*, although the conjunction of the latter two sentences does not suffice to entail the first because two different stabbings may have occurred (say,

with one taking place at midnight and the other being performed with a knife). On the other hand, this asymmetric pattern of entailment is easily derived if each sentence is analysed as an existential quantification over events: from *∃e (stabbing(e) & agent(e) = Brutus & at_midnight(e) & with_a_knife(e))*, it follows straightforwardly that *∃e (stabbing(e) & agent(e) = Brutus & at_midnight(e))* and that *∃e (stabbing(e) & agent(e) = Brutus & with_a_knife(e))*, although the conjunction of the last two formulas does not suffice to entail the first one – which is the desired result. Importantly, neither times nor worlds are sufficiently fine-grained to allow for such an analysis.

Although adverbial modification was the initial motivation for positing events, these have turned out to be extremely useful in the study of verbal aspect, which led to the discovery of surprising analogies between the nominal and the verbal domain. In a nutshell, it was observed that the distinction between so-called **telic verbs** (*die*, *build a house*) and **atelic verbs** (*be happy*, *run*) can be related to the count/mass distinction in the nominal domain. Classically, telic verbs are compatible with the adverbial *in an hour* and not with the adverbial *for an hour* (*John ran/was happy for two hours/*in two hours*), whereas atelic verbs display the opposite pattern (*John died/built a house *for two hours/in two hours*). Researchers found that this distinction was connected to a logical property reminiscent of the nominal domain (Bach 1986). Atelic verbs, like **mass terms** (e.g., *water*), satisfy a property of **cumulative reference**: put together, two events that satisfy the predicate *running* still satisfy the same predicate, just like two samples of *water* that have been put together still count as being *water*. By contrast, *telic verbs*, like **count terms** (e.g., *chair*), fail the test: put together, two events of *building a house* may in general amount to an event of *building two houses* but not of *building a house;* and similarly two chairs put together do not fall under the predicate *chair*, but rather under the predicate *chairs*. The details of the analysis are still the object of lively debate (Rothstein 2004), but there is general agreement that some systematic semantic correspondence between the nominal and the verbal domain is indeed real, and that it can be accounted for in a framework that countenances events.

With events in hand, we may endeavour to revisit the other types of objects we postulated, some of which may now become dispensable (if events are strictly more fine-grained than either times or possible worlds, one may for instance try to define all semantic rules in terms of just individuals and events). But it is very likely that the list is by no means closed. Researchers working on adjectives have posited a rich ontology of **degrees**; those working on locatives have posited **locations**; and those working on manner adverbs have sometimes posited – well, manners. In each case the questions become interesting when one gets specific about the syntax and semantics; and issues we raised about times and possible worlds re-emerge in these new domains: how is reference to these objects effected? And how do the details of the syntax/semantics interface work?

The semantics/pragmatics interface

Implicatures

Even in the simplest cases, the information conveyed by a sentence has two sources: its truth conditions, given by the semantics; but also additional inferences that we typically make by reasoning on the speaker's motives for uttering one sentence rather than another. The latter information is the realm of *pragmatics*.

In a famous example, the British philosopher Paul Grice observed that if I write in a letter of recommendation for my student Bill that *he is always on time and is hard-working*, the recipient will likely infer that Bill should not be hired – but not because any of the qualities I attributed to him was negative. Rather, the fact that I *failed* to mention more directly relevant qualities – such as his intellect, suitability for the job, etc. – suggests that I think he lacks those. Grice called such inferences, which are derived from the assumption that the speaker follows certain rules of cooperative communication, **implicatures**. Although in the present case the boundary between semantics and pragmatics is clear enough, in other cases it is the object of lively debates.

As in other domains of cognitive science, whenever one is interested in the boundary between two modules, one can bring different

kinds of evidence to bear on the cartography that one seeks to establish. Distinct modules may be expected to give rise to different rules, but also to be processed differently in real time, to develop differently in language acquisition, to be realised differently in the brain, and to be affected differently in patients that have brain lesions. Precisely this convergence of approaches is beginning to take shape in the study of the semantics/pragmatics interface. Let us take the example of the little word *or*. In logic, disjunction is, by convention, *inclusive: p or q* is true just in case p or q *or both* are true. But in natural language, one often observes what seem to be *exclusive* readings. If I say that *I'll invite Mary or Ann*, the addressee will infer that not both of them will be invited. One possibility is that contrary to what is posited in logic, the disjunction of natural language is exclusive: *p or q* is true just in case p or q is true, *but not both*. However an alternative theory posits that the exclusive inference is an implicature of a special sort (called a **scalar implicature** because it involves a comparison between different members of the scale <*or*, *and*>). Specifically, we start from the assumption that *or* is inclusive, but postulate that in simple cases the addressee reasons as follows:

(32) Scalar implicatures
   a. <or, and> forms a scale: any use of *or* evokes a possible replacement with *and*, and vice versa.
   b. The version of the sentence with *and* (*I'll invite Mary and Ann*) is more informative than the version with *or* (*I'll invite Mary or Ann*.)
   c. Since the speaker is cooperative, if he had been in a position to use the more informative sentence, he would have done so. This suggests that he was not in a position to utter *I'll invite Mary and Ann* – possibly because he thinks that the conjunction is false.

The comparison between the two theories (exclusive *or* vs. inclusive *or* with implicatures) has yielded considerable evidence for the pragmatic analysis. The first observation is that the inference in question is defeasible – it is no contradiction to say *I'll invite Mary or Ann – in fact I'll invite them both*. Any theory that countenances exclusive *or* has to posit that *or* can *also* be read as inclusive so as to account for this possibility. Thus an ambiguity must be posited. But even so, this analysis can be refuted.

First, *or* is normally treated as inclusive (if uttered with a neutral intonation) in those cases in which the step in (32)b fails, for instance in semantically negative environments. *None of my friends will invite Mary or Ann* definitely rules out that any of my friends invites *both* Mary and Ann, which would be unexpected if *or* could be read exclusively.

By contrast, the facts follow on the pragmatic theory: it is clear that if *none of my friends will invite Mary or Ann (or possibly both)*, then *a fortiori none of my friends will invite both*, which shows that the sentence with *or* is in this case *more* informative than the sentence with *and*. As a consequence, the use of *or* cannot give rise to an implicature.

Second, this analysis makes predictions beyond the data that motivated it. As we just saw, if I say that *None of my friends will invite Mary and Ann*, I will have uttered the *less* informative of the two sentences under comparison. Following the logic of our earlier argument, this should give rise to a new implicature, namely that I was not in a position to say the more informative sentence, *None of my friends will invite Mary or Ann*. If the reason for this is that I take this sentence to be false, we get the pragmatic inference that *At least some of my friends will invite Mary or Ann*, which appears to be just right.

Studies of language acquisition have shown that children acquire implicatures much later than the basic logical properties of connectives such as *and* and *not*. This is fully compatible with the view that implicatures are a different, and possibly more complex, inference than semantic entailments.

Studies of language processing have shown that subjects who do compute the implicature take more time than those who don't – which appears to confirm the view that an additional step of reasoning is necessary to obtain the implicature, as suggested by the theory.

The implicature-based analysis has been extended to numerous other phenomena: in simple clauses, *some* and *most* are both taken to implicate *not all; might* is taken to implicate *not must; good* is taken to implicate *not excellent;* etc. It should be noted that the precise way in which

implicatures are computed has been the object of renewed debate in recent years. Various researchers have argued that *despite* the successes of purely pragmatic accounts, scalar implicatures should be seen as computed in tandem with the syntax and semantics. Other researchers have sought to defend a more traditional pragmatic analysis. The debate is currently open.

Presuppositions

Presuppositions are another domain in which the boundary between semantics and pragmatics is of considerable theoretical interest. Presuppositions are initially characterised by two properties: first, a simple clause *S* with presupposition *P* is odd (neither true nor false) if *P* is false; second, presuppositions give rise to inferences that are inherited by complex sentences differently from normal entailments, or for that matter from implicatures. For instance, presuppositions are preserved when they appear in questions or under negations, which is definitely not the case of entailments: *John is English* entails that *John is European*, but of course *John isn't English* or *Is John English?* have no such entailment. In (33), we see that things are different with presuppositions triggered by *the* (= presupposition that Syldavia has a king), *know* (= presupposition that John is incompetent), and the 'cleft' construction *it is … who …* (= presupposition that someone stole your watch):

(33) a. John doesn't like the king of Syldavia.
  a'. Does John like the king of Syldavia?
  → Syldavia has a king.
  b. John doesn't know that he is incompetent.
  b'. Does John know that he is incompetent?
  → John is incompetent.
  c. It is not John who stole your watch.
  c'. Is it John who stole your watch?
  → Someone stole your watch.

Even more characteristically, presuppositions give rise to universal inferences when they are embedded under the determiner *no* or *none;* for instance, *None of these ten students knows that he is incompetent* leads to the strong inference that *each of these ten students is incompetent* – a pattern which is entirely different from that of entailments or implicatures.

There are two questions that can be asked about presuppositions: first, how are they generated to begin with? Second, how are the presuppositions of elementary clauses transmitted to complex sentences? The first question is still open, but the second question has been the object of intense scrutiny. The simplest theory would be that a presupposition is satisfied just in case it follows from what the speech act participants take for granted in the context of the conversation. This would predict that presuppositions are *always* inherited by complex sentences. Sometimes this is the case; thus the conjunction *John is realistic and he knows that he is incompetent* presupposes that John is indeed incompetent. But the apparently analogous sentence *John is incompetent and he knows that he is* presupposes no such thing; rather, it asserts it (the same 'disappearance' phenomenon occurs in conditionals: compare *If John is realistic, he knows that he is incompetent* – which implies that John is incompetent – with *If John is incompetent, he knows that he is* – which implies no such thing).

A highly influential proposal, due to the philosopher Stalnaker (1974), suggests that the basic account is almost correct, but that there are more contexts than meets the eye: the presupposition of *he knows that he is (incompetent)* is evaluated, not with respect to the initial context, but rather with respect to the modified context obtained after the speech act participants have revised their beliefs on the basis of the first conjunct. Since in this case the first conjunct entails that John is incompetent, by construction the context of the second conjunct will entail it as well – no matter what the initial context was; this means that the sentence *as a whole* will not presuppose anything. This account proved extremely influential, but to be generalised to other connectives and operators it required a rather radical departure from standard assumptions. In particular, it was assumed in **dynamic semantics** that the very meaning of every expression is to modify what is taken for granted in a conversation, which led to a radical revision of the semantic framework: instead of being treated in terms of truth conditions, meanings came to be seen as an *instruction to modify beliefs*. This analysis led to a significant modification of the foundations of semantics; but whether this **dynamic turn** was justified is still the object of lively debates.

Notes

1 This property turns out to be directly connected to one that Tarski used when he sought to define what is a logical operation. His idea was that, in essence, an operation is logical just in case it never discriminates among objects on the basis of their identity (technically, this property is called 'isomorphism-invariance'). Interestingly, however, when Tarski's notion is applied to characterise the class of quantifiers (i.e. expressions of type <<e, t> , t>) which count as logical, one obtains a much richer system than first-order logic – in fact, the resulting class is closer to the quantifiers that are in fact instantiated in the world's languages.
2 If generalised quantifiers can be seen as a generalisation of the quantifiers of first-order logic, plurals are for their part very close to the second-order quantifiers of second-order logic (which also owes much to the work of Frege).
3 The analysis of logical form in syntax interacts with typological considerations. According to syntactic theory, the fact that certain words move 'overtly' vs. 'covertly' is an arbitrary property of a particular language or construction. So there should in principle be languages in which interrogative words move covertly – this has been argued to be the case for Japanese and Chinese. Similarly, there should be languages in which quantifiers move overtly – this has been claimed to be the case of Hungarian.
4 It was traditionally thought that the context parameter differs from other parameters of evaluation in that it remains fixed throughout the evaluation of a sentence (Kaplan 1989). But investigation of other languages than English has recently led to a re-examination of this assumption (several researchers now have argued that some verbs of speech or thought, such as *say* or *believe*, can in some languages manipulate the context parameter).

P. S.

Suggestions for further reading

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Semiotics

Semiotics is most often loosely defined as 'the study of signs' or 'the theory of signs'. Nowadays the term 'semiotics' is generally the preferred umbrella term for this field (at least in English), although the word 'semiology' is sometimes used, being derived from Ferdinand de Saussure's coinage of *sémiologie* (from the Greek *sēmeîon*, a sign) to refer to 'a science which studies the role of signs as part of social life' (1916/1983: 15–16). Saussure saw linguistics as a branch of this new science, a vision later endorsed by Jakobson (1949: 50). Occasionally Saussure's term is reserved for work emerging from the European structuralist tradition which has sought to apply linguistic tools and models to the analysis of 'texts' in any medium. The term 'semiotics' sometimes refers specifically to the tradition of the American philosopher Charles Sanders Peirce (pronounced 'purse'). Working independently from Saussure and going beyond purely verbal signs, Peirce proposed a 'formal doctrine of signs' as an analysis of logic. He used the term *semiotic* (without an 's') as a noun to describe the field, deriving this from John Locke.

Within contemporary semiotics, the most common definition of a sign is that it is a meaningful unit which is interpreted by sign-users as 'standing for' something other than itself. Focusing on linguistic signs (in particular spoken words), Saussure defined a sign as composed of two necessary and inseparable elements – a *signifiant* ('signifier' or 'sound pattern') and a *signifié* ('signified' or 'concept') (Saussure 1916/1983: 66, though beware Harris's substitution of 'signal' and 'signification' for the standard

terms). Signs may take various physical forms – such as spoken or written words, images, sounds, actions or objects. The physical form is sometimes known as the **sign vehicle** – though this is a more materialist concept than Saussure's signifier (Saussure 1916/1983: 12, 14–15, 66). The sign as a whole should not be equated with its physical form (a common casual usage); sign vehicles become transformed into signs only when sign-users invest them with *meaning*.

Saussure stressed the (ontological) arbitrariness of the link between the (linguistic) signifier and the signified (Saussure 1916/1983: 67, 78). There is no inherent, essential, transparent, self-evident or natural connection between the sound (or shape) of a word and the concept to which it refers. Peirce stressed *relative* arbitrariness – varying from the radical arbitrariness of *symbolicity* (e.g., the word 'woman'), via perceived similarity in *iconicity* (e.g., a painted portrait of a woman), to the direct causal connection of *indexicality* (e.g., a woman's fingerprint) (Peirce 1932: 2.275). Under the influence of Jakobson, this distinction has been adopted by many semiotic textual analysts whose framework is otherwise largely Saussurean. Saussure's model of the sign is dyadic whereas Peirce's model is triadic, explicitly featuring not only a 'representamen' (a sign vehicle) and an 'interpretant' (the sense made of it) but also an 'object' to which the sign refers (a referent) (Peirce 1932: 2.228). Saussure 'brackets the referent': excluding direct reference to a world beyond the sign system. His conception of meaning was purely structural and relational rather than referential – signs refer primarily to each other. However, the concepts of resemblance and direct links clearly require real-world referents.

For Saussure, functional relations between signs are seen as of two kinds: *syntagmatic* (concerning positioning) and *associative* (concerning substitution) (Saussure 1983: 121) – the latter now called 'paradigmatic' in accordance with the usage of Jakobson. Structuralist semioticians base formal textual analysis on two axes – the horizontal axis is the syntagmatic plane and the vertical axis is the paradigmatic plane. The plane of the syntagm is that of the *combination* of 'this – *and* – this – *and* – this' while the plane of the paradigm is that of the *selection* of 'this – *or* – this – *or* – this'. 'The cat sat on the mat' is a syntagm where the paradigms are the various substitutions of words that could be made without changing its structure (e.g., for 'cat' we might substitute 'elephant'). Syntagmatic relationships exist both between signifiers and between signifieds. Relationships between *signifiers* can be either *sequential* (e.g., in film and television narrative sequences) or *spatial* (e.g., the 'composition' of a painting, photograph or filmic shot). The 'value' of a sign is determined by both its paradigmatic and its syntagmatic relations. The use of one signifier (e.g., a particular word or image) rather than another from the same paradigm set (e.g., adjectives or shots) shapes the preferred meaning of a text. So too would the placing of one signifier above, below, before or after another (a syntagmatic relation). Syntagms and paradigms provide a structural context within which signs make sense; they are the structural forms through which signs are organised into codes.

Structuralist textual analysis explores both paradigmatic and syntagmatic relations. Syntagmatic analysis seeks to establish the 'surface structure' of a text and the relationships between its parts. The study of syntagmatic relations reveals the conventions or 'rules of combination' underlying the production and interpretation of texts. Paradigmatic analysis seeks to identify the 'underlying' paradigms within the 'deep' or 'hidden' structure of a text or practice. Jakobson built on Saussure's differential model of sign systems, proposing that texts are bound together by a system of binary oppositions (e.g., male/female, mind/body) (Jakobson 1976: 235; cf. 1973: 321). The structuralist anthropologist Claude Lévi-Strauss noted that such linkages become *aligned* in some texts and codes so that additional 'vertical' relationships (e.g., male/mind, female/body) acquire apparent links of their own (Lévi-Strauss 1969 and 1972). Barthes applied to structural analysis a 'commutation test' based on Jakobson's purely phonetic version. In Barthes's version the analyst focuses on a particular signifier in a text and seeks to identify which changes to this signifier would make sense (e.g., white for black) and what the differing (positive and negative) connotations might be, in the process classifying the relevant paradigm sets on which the text draws and the codes to which these belong (e.g., colour symbolism). The same

process enables the text to be divided into minimal significant units, after which the syntagmatic relations between them can be identified (Barthes 1967a: 48 and 1967b: 19–20).

The concept of **markedness**, introduced by Jakobson, is often employed in the deconstructionist analysis of texts and practices (Jakobson 1972: 42 and 1980). It can be applied to both the signifiers and the signifieds of a paradigmatic opposition (such as male/female). Paired signifiers consist of an **unmarked form** (in this case, the word 'male') and a **marked form** (in this case the word 'female'). The marked signifier is distinguished by some special semiotic feature (in this example the addition of an initial *fe-*). Within some texts the marked term may even be suppressed as an 'absent signifier'. Similarly, the two signifieds may be accorded different values. The marked concept (typically listed second in familiar pairings) is presented as 'different' or even (implicitly) negative. The unmarked concept is typically dominant (e.g., statistically within a text or corpus) and therefore seems to be neutral, normal and 'natural'.

Codes are a key concept in structuralist-inspired semiotics. Saussure stressed that signs are not meaningful in isolation, but only in relation to each other (Saussure 1983: 118, 121). Later, Jakobson emphasised that the production and interpretation of texts depends upon the existence of codes or conventions for communication which are at least partly shared (Jakobson 1960 and 1971a). Codes thus represent a social dimension of semiotics. They can be broadly divided into social codes (such as 'body language'), textual or representational codes (such as romanticism) and interpretative codes or ways of reading (such as feminism). Some theorists, such as Umberto Eco, have even argued that our perception of the everyday world involves codes (Eco 1982). Within a code there may also be **subcodes**: such as stylistic and personal subcodes (or **idiolects**).

Not all signs are as 'arbitrary' as the linguistic ones on which Saussure focused, but the Saussurean legacy of the arbitrariness of signs has led many semioticians to stress that even signs which appear 'transparent' – such as in photography and film – are dependent on codes which have to be learned before such signs can be 'read'. While deriving his structuralist approach primarily from linguistics, Barthes went beyond Saussure's focus on purely verbal signs, applying it to a wide range of social phenomena. He sought to 'denaturalise' codes by making more explicit the underlying rules for encoding and decoding texts in order to reveal the operation of ideological forces. It is the *familiarity* of dominant codes which leads texts which employ them to seem like recordings or direct reproductions of reality. Despite his oft-quoted assertion that 'the photographic image … is a *message without a code*' (Barthes 1961: 17), he went on to argue that the apparent identity of the signifier and the signified in this medium is a powerful illusion. No sign is purely denotative – lacking connotation – 'Every sign supposes a code' (Barthes 1961: 17).

Barthes adopted from Louis Hjelmslev (1961) the notion that there are different 'orders of signification' (levels of meaning) in semiotic systems. The first is that of **denotation**: at this level there is a sign consisting of a signifier and a signified. **Connotation** is a second order which uses the denotative sign as its signifier and attaches to it an additional signified. An image denoting 'a child' in a context which generates the connotation of innocence would feed into a 'myth' of childhood which functions ideologically to justify dominant assumptions about the status of children in society. Myths constitute a *metalanguage* – 'a system whose plane of content is itself constituted by a signifying system' (Barthes 1967a: 90; cf. Barthes 1957: 124). The mythological or ideological order of signification can be seen as reflecting major (culturally variable) concepts underpinning particular world views.

While all verbal language is communication, most communication is non-verbal. In an increasingly visual age, an important contribution of semiotics from Barthes onwards has been a concern with signs in the forms of images, particularly in the context of advertising, photography and audio-visual media. Sign systems with more than one level of structural 'articulation' (as in verbal language) include smaller units than the sign – minimal functional units which lack meaning in themselves (e.g., phonemes in speech or graphemes in writing). **Analogical signs** (such as oil paintings, photographs or gestures) involve graded relationships on a continuum rather than discrete units (in contrast to **digital**

signs). Sign systems which are not reducible to minimal meaningless units lack the double articulation of verbal language, so references to 'visual language' can be misleading. Barthes emphasised the importance of the verbal 'anchorage' of polysemic images (Barthes 1964: 38ff.), and contemporary semoticians stress the interdependence of visual and linguistic codes in such texts.

Saussure's linguistic theories constituted a starting point for the development of various structuralist methodologies for analysing texts and social practices. These have been very widely employed in the analysis of many cultural phenomena. Despite his brief (albeit definitional) allusion to 'the role of signs as part of social life', Saussure did not explore the social constraints on meaning-making. His focus, of course, was on *langue* rather than on *parole* – on formal systems rather than on processes of use and production. Even Barthes, who argued that texts are codified to encourage a reading which favours the interests of the dominant class, confined his attention to the textual codes without fully engaging with the social and historical context of interpretation.

Whatever the limitations of some of its manifestations, the legacy of structuralism is a toolkit of analytical methods and concepts which have not all outlived their usefulness. However, semiotic theory and practice have continued to evolve. Jakobson insisted that the interpretation of signs depends not only on codes but also on context (Jakobson 1953: 233, 1956: 75, 1960: 353). He also prefigured the recent re-emphasis on the materiality of the signifier (Jakobson 1949: 423). Since the second half of the 1980s, 'social semiotics' has been adopted as a label by members and associates of the **Sydney Semiotics Circle**, much influenced by Halliday (1978), whose functionalist approach to language stresses the contextual importance of social roles. Practitioners have sought to study 'signifying practices' in specific social contexts; members of the Sydney circle established the journal *Social Semiotics* in 1991. Not the least of the values of such developments is the potential to attract back to semiotics some of those who were alienated by structuralist excesses. The extent to which socially oriented semiotics has so far met the concerns of sociologists is debatable; however, 'social semiotics' is still under construction. Semiotics, always a site of struggle, nevertheless transcends its various schools.

D. G. C.

Suggestions for further reading

Chandler, D. (2007) *Semiotics: The Basics*, 2nd edn, London: Routledge.

Eco, U. (1976) *A Theory of Semiotics*, Bloomington, Ind.: Indiana University Press and London: Macmillan.

Nöth, W. (1990) *Handbook of Semiotics*, Bloomington, Ind.: Indiana University Press.

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Sign language

Introduction

By **sign language** is usually meant a visual-gestural, non-vocal language used primarily by the deaf, and one not based on the language of the surrounding hearing community. Sign language is not to be identified with signed versions of spoken languages and cannot be translated sign-for-word into speech any more than two spoken languages are word-for-word intertranslatable. Sign language is not international; most signs used in different countries are no more alike than the words used in different countries.

A sign language almost always develops among groups of deaf-born people, even groups who are being taught to communicate orally (Wright 1969). Only a minority of deaf people (about 10 per cent; Deuchar 1996/1999: 566) have the opportunity to acquire sign language from birth, because most deaf children are born to hearing parents. However, in those cases where sign language is acquired from birth, the stages of acquisition appear to be similar to those for spoken language [*see* LANGUAGE ACQUISITION], although the process seems to begin earlier in the case of sign language (Deuchar 1984: 161).

The first school for the deaf to receive public support taught a sign language which its founder, Abbé de l'Epée, had developed by adding French grammar to the indigenous sign language of the poor deaf of Paris. l'Epée's school was established in 1755. He taught his pupils to read and write by associating signs with pictures

and written words, so that they could write down what was said to them with the help of an interpreter and thus acquire a formal education. By the time of l'Epée's death, in 1789, teachers trained by him had established twenty-one schools for the deaf in France, and by 1791 l'Epée's own school had become the National Institute for Deaf-Mutes in Paris led by the grammarian Sicard. His pupil, Roch-Ambroise Bébian, removed the imposition of the grammar of French from the indigenous sign language of the deaf, realising that the latter had its own grammar (Sacks 1989/1990: 16–20).

Sign language exists wherever groups of deaf people exist. Van Cleve (1987) contains descriptions of over fifty native sign languages, but in this entry I shall concentrate on American Sign Language (ASL) and British Sign Language (BSL). Like all sign languages, each of these has its own syntactic rules. However, when they are used to accompany speech, the order of signs may reflect the word order of the spoken language, and incorporate special signs for English inflectional morphology. For example, the English words *sits* and *sitting* can be represented by the sign for SIT followed by separate sign markers invented for the English third person present indicative and the English progressive inflections (Klima and Bellugi 1979: 244). In such circumstances the signed language is referred to as **Signed English**.

Neither Signed English, nor the Paget Gorman Sign System, nor Cued Speech are to be identified with ASL or BSL. The **Paget Gorman Sign System (PGSS)** was developed by Sir Richard Paget and Pierre Gorman between 1934 and 1971. Its signs are largely iconic representations combined with signs for affixes, and it was intended as an aid to the teaching of English, to be phased out as competence in English grew. **Cued speech** is designed to assist the process of lip reading by providing disambiguating signs for sounds which look identical on the lips (Deuchar 1984: 37; see further Griffiths 1980 for details of PGSS, and Cornett 1967 for further details of cued speech).

American Sign Language

The history of ASL begins with the establishment, in 1817, of the American Asylum for the Deaf in Hartford by Laurent Clerc, the Reverend Thomas Gallaudet and Mason Cogswell. Cogswell was a surgeon whose daughter was deaf. No special educational provision was made for the deaf in America at that time, and Cogswell and Gallaudet wanted to establish a school for the deaf in Hartford. Gallaudet went to Europe to seek expert assistance. Having been turned away by the Braidwoods in Britain because they kept their methods secret, he recruited Clerc, a deaf-mute French teacher of the deaf trained in the Sicard tradition.

The Hartford Asylum was successful, and other schools for the deaf were established as teachers were trained at Hartford. The French Sign Language (FSL) used by Clerc amalgamated with indigenous sign languages used in America – in particular, the language used by the deaf of Martha's Vineyard, where a substantial proportion of the population was subject to hereditary deafness – to become ASL. Possibly because of the early influence on ASL by FSL, ASL appears to be more similar to FSL than to BSL (Deuchar 1984: 2). In 1864, the Columbia Institution for the Deaf and the Blind in Washington became the first college for the deaf, under the leadership of Edward Gallaudet, Thomas Gallaudet's son. The institution was renamed Gallaudet College and is now **Gallaudet University**, still the only liberal arts college for the deaf in the world.

After its initial success, however, ASL came under attack from members of the **oralist school**, including Alexander Graham Bell, whose influence was so great that oralism prevailed, and the use of signs in schools was proscribed at the International Congress of Educators of the Deaf held in Milan in 1880. Since this resolution necessitated that teachers of the deaf be able to speak, the proportion of deaf teachers of the deaf fell from nearly 50 per cent in 1850 to 25 per cent by the turn of the century, and further to 12 per cent by 1960.

The rationale for oralism is that deaf people who can only use sign language are excluded from spontaneous communication with hearing people, very few of whom know how to sign. Bell thought that, just as sign language held the deaf community together, it kept deaf people from integrating with the rest of society, and that the teaching of speech and lip-reading was essential

if deaf people were to achieve full integration. Unfortunately, however, the price most deaf people have to pay for speech to the exclusion of sign language seems to be a dramatic reduction in their general educational achievements. Whereas pupils who had been to the Hartford Asylum and similar schools in the 1850s reached standards similar to those of their hearing counterparts, and had, effectively, achieved social integration through education, a study carried out by Gallaudet College in 1972 shows an average reading level for eighteen-year-old deaf high-school graduates comparable to that of fourth-grade pupils. Conrad (1979) shows a similar situation for deaf British students, with eighteen year olds having a reading age of nine (Sacks 1989/1990: 21–9).

Because deaf people cannot hear the sounds made by other speakers, or by themselves, they cannot compare their own efforts at accompanying lip shapes with sounds to the sounds produced by hearing people. Hence, they are left to try to work out the system of speech from visual clues which are far less specific and detailed than the signs of sign language, and from instructions on how to use their vocal apparatus. But such instructions cannot make up for a deaf person's inability to monitor the sound itself: one has only to listen briefly to someone wearing headphones trying to sing along to music they hear through them to realise how important the ability to monitor one's own sounds is. In contrast, signed language appears naturally among groups of deaf people, for whom it provides everything that speech provides for people who can hear (including poetry, song and humour produced by play on signs: see Klima and Bellugi 1979: chapter 4) and, as Deuchar (1984: 175) points out, the recognition and use of sign language in schools would probably increase deaf people's confidence and their desire and ability to learn English, 'and would ultimately aid their integration as bilingual, bicultural adults, into both the deaf and the hearing communities'.

ASL was the first of the world's sign languages to be studied by linguists. It is the subject of Klima and Bellugi's (1979) *The Signs of Language*, in which description is strongly supported by psycholinguistic experiments. Each sign of ASL is describable in terms of three parameters on which significant contrasts are set up between signs (namely, **location**, **hand-shape** and **movement**) and a limited number of combinations are permitted within each parameter. Stokoe (1960) describes nineteen hand shapes, twelve locations and twenty-four types of movement and provides a notation for ASL comparable to phonetic notation for speech. Location is called **tab** in the notation system; the part that acts (say, the index finger) is called **dez**; and the action performed is called **sig** (Deuchar 1984: 54).

Stokoe et al.'s *Dictionary* (1976) lists 3,000 root signs arranged according to their parts and organisation and the principles of the language. The following notation is used for tab (Deuchar 1984: 59–60):

∅	neutral space in front of body
◌	whole face
◠	upper face
⊔	nose
◡	lower face
⦘	cheek
⊓	neck
[ ]	central trunk
∿	shoulder and upper arm
✓	forearm/elbow
∅	back of wrist

A one-handed finger-spelling system can be used in conjunction with ASL for spelling out names or words for which no sign exists, and is also used as a notation for dez (Deuchar 1984: 61–4):

> A: closed fist; Ȧ: thumb extended from closed fist; B: flat hand, fingers together, thumb may or may not be extended; B̈: as for B, but hand bent; 5: same as for B, but fingers spread; 5̈: bent 5, 'clawed hand'; C: fingers and thumb bent to form curve as in letter 'c'; G: index finger extended from fist; O: fingers bent and all touching thumb; F: index finger and thumb touching, all other fingers extended; H: index finger and middle fingers extended from closed fist and held together; I: little finger extended from closed fist; L: index finger and thumb extended from closed fist; R: index and middle fingers extended and crossed, as in crossing one's fingers for good luck; V: index and middle finger

extended from fist and held apart; V̈: as V, but with fingers bent; W: the middle three fingers extended from fist, may or may not be spread; X: index finger extended and bent; Y: thumb and little finger extended from fist; 8: middle finger bent, rest of fingers open.

The notations for sig can be divided into three categories; as shown in Table 1 (Deuchar 1984: 69, roughly following the categories set up by Brennan et al. 1980).

As mentioned above, a number of constraints operate on the combinations of formal elements into ASL sign forms. For example, Battison (1974) observes that two-handed signs (see below) are constrained by the symmetry constraint and the dominance constraint. The **symmetry constraint** operates in such a way that in the vast majority of cases of signs in which both hands are used, both assume the same shape, location and movement. The **dominance constraint** restrains the shape of the non-leading hand in two-handed signs of type 3 (in which the leading hand contacts the other but the hand-shapes are different: see below) to one of six – A, B, 5, G, C and ø. These seem to be the most basic hand shapes: they account for 70 per cent of all signs and are among the first acquired by deaf children of deaf parents (Boyes-Braem 1973; Klima and Bellugi 1979: 63–4).

As mentioned above, ASL can employ a finger-spelling system to sign concepts or phenomena for which no sign exists. However, sign language exhibits the same facility as spoken language for creating new lexical items by compounding. Klima and Bellugi (1979: 198–9) mention the phenomenon, 'streaker', new to the 1970s, for which a sign compounded of the signs for NUDE and ZOOM OFF was invented which became conventional throughout the deaf communities of the USA.

A compound is distinguished from the phrase consisting of the two words (BED SOFT meaning 'pillow' from BED SOFT meaning 'soft bed') by temporal compression, particularly of the first sign in the compound, by loss of repetition of movement in the second sign, by overlap between a first sign made by one hand and a second sign made by the other, and by smoothing of the transition between the two signs, for example by bringing the two signs closer together in the signing space (see below). Finally, compression may integrate the movements of the two signs into one smooth flow (Klima and Bellugi 1979: 202–21). Newly coined signs are constrained in the same way as established signs.

Table 1

Direction	Manner	Interaction
∧ up	ɑ supinating rotation	)(approach
∨ down	ɔ pronating rotation	× contact
∿ up and down	ω twisting	∩ link or grasp
> right	@ circular	+ cross
< left	ɳ nodding or bending	÷ separate
≷ side by side	□ opening	⟲ interchange
⊤ towards signer	# closing	~ alternation
⊥ away from signer	⍵ wiggling	
⌶ to and fro		

Existing signs may also be extended in meaning, but such extensions are usually accompanied by a change in the sign, so that there are very few ambiguous signs. For example, the ASL sign for QUIET, which is made by moving both hands from a position in front of the lips downwards and outwards, is modified in the derived sign for TO ACQUIESCE so that the hands move down only, but until they 'hang down' from the wrists (Klima and Bellugi 1979: 200–1). Nouns are derived from verbs, for example ACQUISITION from GET, by diminishing and repeating the movement of the verb (Klima and Bellugi 1979: 199–201).

A number of specific changes in the form of signs, called **modulations**, correspond to specific changes in the signs' meaning. These include, among others, the **circular modulation**, which appears in citation signing (see below) as a superimposed circular path of movement described by the hands. The circular modulation adds to the meaning of the sign the notion 'is prone to be' or 'has a predisposition to be' or 'tends to be'. It is the archetypical modulation on adjectival predicates like SICK, and Klima and Bellugi (1979: 249) refer to it as **modulation for predispositional aspect**. Only signs which refer to incidental or temporary states, such as ANGRY, DIRTY and SICK can undergo this modulation and, when they do, they refer to characteristics which are natural to the person, item or phenomenon of which they are predicated, for instance SICKLY. When such signs undergo a different modulation, the **thrust modulation**, a single thrust-like movement combining a brief tense motion with a lax hand shape, they refer to a readiness for the state, quality or characteristic to develop, or to a sudden change to that state, so Klima and Bellugi (1979: 255) call this the thrust modulation for **susceptative aspect**. When the sign for SICK is modulated in this way, it means 'get sick easily'. Signs which stand for characteristics which are by nature inherent or long-lasting, such as PRETTY, INTELLIGENT, HARD, TALL and YOUNG cannot undergo circular or thrust modulation.

Transitory state adjectival predicates and durative verbs can accept the **elliptical modulation for continuative aspect**, a slow reduplication, which adds to the sign the meaning 'for a long time'; the **tremolo modulation for incessant aspect**, a tiny, tense, uneven movement made rapidly and repeatedly, which adds to the sign the meaning 'incessantly'; and the **marcato modulation for frequentative aspect**, which has a tense movement, well-marked initial and final positions, and a regular beat of four to six reduplications and which means 'often occurring' (Klima and Bellugi 1979: 256–8).

The meanings 'very' and 'sort of' can be added to a sign by the **tense and lax modulations for intensive and approximate aspects**, respectively. The change in movement for the former is tension in the muscles of hand and arm, a long tense hold at the beginning of the sign, a very rapid single performance, and a final hold. The change in movement for the latter is a lax hand-shape and an extreme reduction in size and duration of each iteration of the sign (Klima and Bellugi 1979: 258–60).

The meaning 'to become' is conveyed by the **accelerando modulation for resultative aspect**. In this aspect, the sign for RED, which is made by a soft downward brushing motion made twice, is made only once and with a tense motion, which starts slowly before accelerating to a long final hold (Klima and Bellugi 1979: 260–1).

Klima and Bellugi (1979: 269–70) point out that the many forms displayed by modulations are realisations of grammatical processes: they differ systematically on a limited number of dimensions and the differences in dimensions correlate with a network of basic semantic distinctions. They display this as in Table 2. In general, sign language morphology tends to resist sequential segmentation at the lexical level and to favour superimposed spatial and temporal contrasts in sign movement (Klima and Bellugi 1979: 274). For syntactic use of the signing space, see below.

British Sign Language

The first school for the deaf in Britain was established by Thomas Braidwood in Edinburgh in 1760. Braidwood kept his methods of instruction secret, but he seems likely to have employed a combination of speech, lip-reading and signs (McLoughlin 1980). In this and similar schools

Table 2

Pairs of modulations	*Reduplicated*	*Even*	*Tense*	*End-marked*	*Fast*	*Elongated*	
Predispositional 'be characteristically sick'	+	+	−	−	+	+	transitory state
Susceptative/frequentative 'easily get sick often'	+	+	−	+	+	+	change to state
Continuative 'be sick for a long time'	+	−	+	−	−	+	transitory state
Iterative 'keep on getting sick again and again'	+	−	+	+	−	+	change to state
Protractive 'be sick uninterruptedly'	−		+			−	transitory state
Incessant 'seem to get sick incessantly'	+	−	+	+	+	−	change to state
Intensive 'be very sick'	−	+	+	+	+	+	transitory state
Resultative 'get sick'	−	−	+	+	−	+	change to state

opened in other parts of the country, deaf people could come together and the sign language they used among themselves could begin to become standardised. The Braidwood Academy, which was fee-paying, was moved from Edinburgh to London in 1783, and in 1792 a society was formed to provide free education for the deaf in 'asylums', the first of which, in London, was run by Braidwood's nephew, Joseph Watson. After Braidwood's death in 1806 Watson published *Instruction for the Deaf and Dumb* (1809), from which it is apparent that he knew sign language and that he thought that all teachers of the deaf should learn it and use it to introduce the deaf to speech (Deuchar 1984: 31–2).

When the last of the Braidwoods, Thomas (the younger), died in 1825, he was replaced by a Swiss, Louis du Puget (Hodgson 1953: 163). Du Puget introduced Epée's silent method (see above). But from the 1860s onward BSL experienced a period of declining status similar to, and for the same reasons as, those described above for ASL. But the system of education for the deaf was kept entirely segregated from the rest of the education system until 1944 so that, although the aim of the system was to teach the deaf to use oral language, the schools provided a meeting ground for the deaf where they could sign between themselves.

Signing was also used in the 'missions' often attached to the schools. Missions were charitable organisations concerned with the spiritual welfare of the deaf, often established on the initiative of local deaf people themselves, and they also provided space for recreational and other social activities. The missions have developed into centres for the deaf which are to be found in most large British towns, but have become largely detached from schools for the deaf, most of which are residential. Therefore most children do not become fully integrated into their local deaf community until they leave school, and the school community and the adult community tend to use different variants of sign language. This situation bears some similarity to that which pertains to accent and dialect in spoken language – adult signers can usually tell where other signers come from and where they went to school (see further below) (Deuchar 1984: 32–5).

It was not until the 1980s that, largely as a result of action by the British Deaf Association and the National Union of the Deaf, BSL began to be perceived as a proper language, to gain a degree of official status and to find its way into some classrooms and onto the nation's television screens (Miles 1988: 19–40). BSL has therefore developed through its use in the deaf communities around Britain and it displays some regional

and other types of variation, just as spoken language does.

Sign-language use necessitates a certain amount of space in front of and to the sides of the body in which to sign. This space, plus the front and sides of the body from the head to just below the waist, is known as the **signing space**. However, the signer's face remains the focus of gaze during signing, and movement of the hands is perceived by area vision (Miles 1988: 53). Signs that are supported by the face, head and the body from the waist up are called **multi-channel signs**.

A forward tilt of the body indicates astonishment, interest or curiosity, while a backward tilt indicates defiance or suspicion. Hunched shoulders imply effort, rising chest shows pride, and falling chest suggests discouragement. In addition, shifts in body direction and mime-like movements can aid storytelling and the reporting of events (Miles 1988: 64–5).

Nodding and shaking the head are used to reply 'Yes' and 'No', as in speech, but also to affirm and negate propositions. Thus rubbing the clenched leading hand (see below) with the thumb pointing upwards up and down on the stomach means 'I am hungry' when accompanied by nodding, and 'I am not hungry' when accompanied by a head-shake. Nods and tilts of the head also act as punctuation between and within sentences, and head movement can be used to indicate location (Miles 1988: 63–4).

Facial expressions include standardised versions of expressions used by everyone to express emotion, such as positive and negative face. Similarly, an open mouth with clenched teeth indicates stress or effort, while a loose pout with slightly puffed cheeks suggests ease; a loose or open mouth, possibly with the tongue showing, suggests carelessness, lack of attention or ignorance. Lips pulled tight as in saying *ee*, with the teeth just showing, suggests intensity or nearness or exactness. In descriptions of sizes, volumes, etc., fully puffed cheeks mean 'a great amount' while pursed lips and sucked in cheeks mean 'a small amount'. The lip movements of words can also be used to disambiguate signs. For example, the sign for a married person can be accompanied by the lip shape for *hu-sp* to indicate that the married person in question is male (Miles 1988: 59–62).

The eyes are used to show surprise (wide eyes) and doubt (narrow eyes). Narrow eyes can also show intensity of judgements, making the difference between the signs for *far* and *very far*, *good* and *very good*, and so on. The direction of the signer's gaze can be used like pointing to indicate the location and movement of things. Raised eyebrows accompany questions (Miles 1988: 62–3).

Just as speech makes some limited use of imitation of natural sounds, **onomatopoeia**, some manual signs imitate actions, shapes, sizes, directions, and so on. Some signs, like that for *drink*, in which the hand imitates the shape and movement involved in holding a glass and putting it to one's lips, are **transparent**; that is, they would probably be understood even by people who do not know sign language. Other signs, in which the link between meaning and form only becomes apparent when it is explained are called **translucent**. The sign for *cheap*, for example, involves a downward movement which may suggest that something is being reduced. Signs which give no visual clues to their meaning are called **encoded**. **Iconic** or pictorial signs can be made by the fingers or the hand outlining the shape, size or action of an object. For example, the sign for *scissors* is made by the middle and index fingers performing movements similar to those of the blades of a pair of scissors. If the hand simultaneously moves across in front of the body, the sign means 'cut' (see further Miles 1988: 66–76).

There are three kinds of manual sign – one-handed, two-handed and mixed – each having different types. One-handed signs are made by the right hand if the signer is right-handed and by the left if they are left-handed. The hand used for one-handed signs is called the **leading hand**. One-handed signs are either made in space (type 1) or by touching a body part (though not the other hand) (type 2).

Two-handed signs are of three types. Signs of type 1 are made with both hands moving either in space or touching each other or the body. Signs of type 2 involve the leading hand contacting the other while both hand-shapes are the same. In signs of type 3, the leading hand contacts the other, but the hand-shapes are different.

A **mixed sign** is a sign which begins as one-handed and becomes two-handed, or vice versa,

as in the sign for *believe*, in which the signer first touches their forehead just above the eye with the index finger of the leading hand and then brings that hand down in front of the chest, with the palm facing it, to make contact with the horizontal, upward-facing palm of the other hand (Miles 1988: 54–5).

Each sign of sign language can be described in isolation, but, just as words in sentences do not sound the same as their **citation forms** (the way they sound when pronounced one at a time out of context), signs adapt to context as the hands rapidly change from one shape to another. There are more than fifty hand-shapes in BSL and around twenty-five identifiable places in the signing space. The signs are described in terms of place, movement and the direction in which the palm and fingers face (Miles 1988: 56–7), and Stokoe's tab, dez and sig, developed for ASL (see above), can be applied to BSL signs too, as Deuchar (1984: 54) demonstrates: the sign for I in BSL is made by the index finger pointing to and touching the chest, and can thus be described as:

tab: chest;
dez: index finger extended from closed fist;
sig: contact with tab.

The sign for THINK in BSL is made by the index finger pointing to the forehead, so it can be described as:

tab: forehead;
dez: index finger extended from closed fist;
sig: contact with tab.

This shows the signs I and THINK to be **minimal pairs**: they differ only on one parameter, tab. Similarly, THINK and KNOW are minimal pairs differing only in dez, and KNOW and CLEVER are minimal pairs which contrast in sig (Deuchar 1984: 55):

	KNOW	CLEVER
tab:	forehead	forehead
dez:	thumb extended from closed fist	thumb extended from closed fist
sig:	contact with tab	movement from right to left in contact with tab

For BSL, the following symbols for tab, dez and sig have been added to Stokoe et al. (1976) (see above):

Tab

⊓	top of head	⋈	eyes
⊍	mouth/lips	⊃	ear
⌐ ¬	upper trunk	⌊ ⌋	lower trunk

(Deuchar 1984: 604)

Dez

⅄ middle finger extended from fist

(Deuchar 1984: 604)

Sig

⩛	crumbling action	ø	no movement

(Deuchar 1984: 604)

The signing space forms an arena in which aspects of the syntax of sign language can be displayed through spatial relations between the signs and the type and frequency of their movements. For instance, the information encapsulated in the sentence *The house is on a hill, with a path winding up to it* can be provided in sign language by establishing a hill by moving the arms with the hands flat and palms down sideways upwards, then forming the top of the hill; next making the sign for *house* by touching the tips of the fingers of each hand to each other, arms still stretched upward where the hill is; bringing down the arms and forming a path leading up the hill with the index and middle finger of both hands tracing the path; then tracing a road below the hill with both hands flat, palms facing each other, and moving together across below where the hill has been established.

Anaphora, backward reference, can be made to items already placed in the signing space by pointing to them (Miles 1988: 88–9). This means that in many cases there is no need to employ the third person pronoun. However, sign-language grammar is not dependent on linearity, since more than one sign can be made simultaneously. For example, whereas in speech the words in a sentence must follow one another linearly, as in *a small boy who was born deaf*, in BSL the left hand can sign BOY while the right is signing SMALL; the left hand can sign BORN while the right is signing DEAF (Woll 1990: 775). In addition, signs made with the hands can be accompanied by non-manual behaviour: clause connectors are made with the head and eyebrows; for example,

in an *if–then* construction, the *if-* part is signed with raised brows and the head tilted slightly back, and the brows and head drop to introduce the *then*-part. The topic of a sentence is introduced first, often with raised brows and a backward head-tilt, followed by the comment, often accompanied by a nod.

A sign moves from the direction of the subject of the sentence towards the object, so that there may be no need to mark subject and object by pronouns. When pronoun signs are used, they are usually made at the beginning of a sentence and repeated at the end. In reporting the speech of others, the signer can adopt their different roles by body shift and eye gaze, and portray the different emotions of the interactants through facial expressions. As mentioned above, mood and modality can be indicated with the face, head, eyes and eyebrows.

Tense can be marked by using the signs for *will* (future), *now* (present) and *finish* (past). Tense and aspect are also marked by the use of four **timelines**, A, B, C and D:

- A, past to future, runs from just behind the signer's shoulder to 50 cm or so in front of him or her. Signs made just above or behind the shoulder indicate past time. Distant past is indicated by circling both hands backward alternately, and increasing the size, number and speed of the circles in tandem with the length of time being described. To show the passing of time, the hands circle forward.
- B, short time units, runs along the arm and hand that is not a signer's leading arm and hand. It is used to show calendar time, succession and duration.
- C, continuing time, crosses in front of the signer; the sign for *now* or *today* is made here, but timeline C generally represents continuous aspect, particularly if the sign moves from left to right.
- D, growing time, which is indicated by moving the flat hand with palm pointing down, from the position it would take to indicate the height of a hip-high child, upwards to shoulder height. The signs for *small*, *tall*, *child(ren)* and *adult* are made at points on this line, while for *grew up* and *all my life* the hand moves upward (Miles 1988: 90–105).

Plural number can be indicated by repetition of a sign. For example, the sign for CHILDREN is made by repeating the sign for CHILD. However, signs which involve the use of extended fingers can also be modified to include reference to plural number. For example, the two-finger hand-shape of the sign for DEAF PERSON can be replaced by one involving three fingers to indicate THREE DEAF PEOPLE, and the sign for GIRL, which involves the use of the index finger can be made to mean THREE GIRLS by the use of three fingers (Deuchar 1984: 87–8). Some one-handed signs (AEROPLANE, CUP) can be pluralised by making the sign with both hands (Woll 1990: 762).

A two-handed finger spelling system, the **British manual alphabet**, is used with BSL for spelling names and words for which no sign exists. The hands form the shapes of the letters, and some signs, for instance, for *father*, *daughter*, *bible*, *kitchen* and *government*, are made by repetition of the finger-spelled initial letter of the corresponding word (Miles 1988: 845).

There are several number systems used in BSL in different areas of Britain. They all involve a complex use of the fingers and various hand-shapes. For example, in the system used in the south of England, the sign for 3 is made with the palm towards the body and the index, middle and ring fingers of the hand pointing upwards, while the thumb and little finger are folded into the palm; the sign for 8 is made with the palm towards the body, the thumb pointing upwards, and the index and middle finger pointing across the front of the body. Each region has its own way of using the number system for indicating the time. A number sign starting near the mouth indicates that the number is a number of pounds (£); if it moves out from the nose, it indicates age (Miles 1988: 79–81).

BSL has its own discourse rules (Miles 1988: 51–3). For instance, it is considered bad manners to get someone's attention by turning their face towards you, as a child might do, to wave your hand in front of their face, or to flick the light on and off, *unless* you want to address all of a large group. Tapping a person on the arm or shoulder, and not anywhere else, is the polite means of getting their attention, but the tapping must not be too hard or too persistent. Taps can be relayed by bystanders, if one is out of

physical reach of the person one wants to communicate with.

To show attention, a person is expected to keep looking at the person who is signing and they may nod to show comprehension, agreement or just general interest. Looking away is interpreted as an interruption of the signer.

Bidding for a turn is done by catching the eye of the other person, or by bringing one's hands up ready for signing. A person finishing a turn will drop her/his hands from the signing space and look at another participant in the conversation.

K. M.

Suggestions for further reading

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Slang

Introduction

Probably, although not provably, a universal feature of human languages (examples that follow are drawn from English, particularly British English), 'slang' is a label familiar to the public, which has been problematised or avoided by some academic linguists. We should remember that 'neither the social nor the linguistic meaning of slang is fixed and determinate, and what counts as slang … is itself negotiated in discourse' (Bucholtz 2001). Lexicographers treat slang as a category in its own right, collect examples and offer definitions and etymologies but rarely analyse its usage or the socio-cultural practices of which it is a component. What a non-specialist hearer deems to be slang will depend upon a range of variables such as age, frequentation, exposure to variant vernaculars, literacy, etc.

One useful way of characterising slang is as a style of language occupying, along with intimacies such as 'baby talk' and terms of endearment, the extreme 'informal' position on a continuum representing degrees of formality. Slang is coined, adopted and used, and evolves separately from or in deliberate contrast to what are thought to be the standard and prestige varieties of a language. It may differ from supposed norms in terms of syntax and phonology (non-specialists often characterise unfamiliar variants, such as ethnically marked speech, or regional dialect as slang) but is most noticeably a specialised lexicon or vocabulary. Slang is often therefore viewed as primarily 'lexical', where **lexis** extends beyond the word to take in compounds, phrases, slogans and other **prefabricated units** or **chunks** of language up to sentence level ('Who's eaten all the pies?' said in the presence of an obese person; 'Get a room!', an admonition to those engaged in a 'PDA' or public display of affection). Slang generally originates within small self-defined **communities of practice** or **communities of circumstance** – otherwise known as cliques, gangs, **friendship groups** or **peer groups**, **micro-niches**, **micro-cultures** or (larger) **sub-cultures** – where it is used to rename aspects of shared experience and environment or to name aspects not hitherto describable. Some slang terms may emerge from the small **in-group** to be taken up by a cohort of contemporaries, may then be adopted by larger **speech communities** for more widespread, still highly informal usage ('cool' in global Englishes, for example), while a few cross over into mainstream use and lose their idiosyncratic associations ('rogue', 'mob' and 'bus' began as slang). Chapman (1986: xii) refers to **primary** and **secondary** slang, primary being slang in its original restricted context, while secondary slang has transcended social, regional and generational boundaries.

Slang uses imaginative techniques to situate itself in relation to conventional language, altering existing terms, changing their meanings, but only very occasionally (in English at least) creating completely unprecedented forms. It mobilises the technical and rhetorical potential of the

language on which it is based just as literature or poetry does, but without the latter's allusiveness – unless it is being used to baffle its hearer, slang is designed for unambiguous decoding and mutually understood allusions.

Slang relies for its effect upon its own **alterity** or 'otherness', with suggestions of the deviant, the audacious and/or the mischievous. In many instances of use its novelty or unfamiliarity give it its special resonance (words or expressions designed expressly to be fashionable are known as **vogue terms**). For a particular in-group the terms they use as a label of identity and to reinforce their exclusivity will have symbolic importance over and above their defining function – an important **connotative** as well as **denotative** dimension. Though the terms themselves vary from group to group and over time, the significance of slang itself as a **linguistic practice** remains consistent.

Problems of definition

As a category slang is elastic or fuzzy. It includes:

- sub-sets of the lexicon, such as nicknames, **taboo terms** and **profanity** (swearing and sexual and racial insults), catchphrases and slogans, colloquial **jargons** (specialist terminology for work, technology, entertainment genres or hobbies), SMS texting and internet-users' abbreviations and respellings;
- ethnic variants such as African American vernacular, Afro-Caribbean creole and Black British colloquialisms, and so-called **Hinglish** (informal expressions like 'chuddies' for underpants, used by some South Asian speakers);
- disguising codes like **pig Latin** (which alters words by moving consonants and adding syllables, so that 'thick' becomes 'ickthay') and **backslang** (in which boy becomes 'yob' or the number six 'exis');
- obsolescent **secret languages** like Polari, a romance language-based pidgin spoken by players, pedlars and homosexuals.

Song lyrics (notably from rap and hip-hop culture) and movie scripts may appropriate, imitate or parody real slang before returning it to its originating milieux.

Slang is used as a categorising label in general dictionaries but is not applied consistently (Eble 1996). So complex and extensive a psycho-sociolinguistic phenomenon is difficult to encapsulate in a neat formulation and linguists' own terminology can be inexact – the definition and scope of terms sometimes applied to slang, **register**, **social dialect** or **sociolect** or **style** are not universally agreed by specialists.

One widely quoted attempt to describe the functions and characteristics of slang was made by the language enthusiast Eric Partridge (1933), who listed fifteen reasons for its use. These included 'just for the fun of the thing', in playfulness or waggishness; to be different, to be novel; to induce either friendliness or intimacy; to show that one belongs; to show or prove that someone is not 'in the swim'; to be secret.

Linguists Dumas and Lighter (1978: 14–16) wondered whether the label was meaningful and posed the challenge, 'Is *slang* a word for linguists?' They attempted an answer by offering four defining features:

1. Its presence will markedly lower, at least for the moment, the dignity of formal or serious speech or writing.
2. Its use implies the user's special familiarity either with the referent or with that less statusful or less responsible class of people who have such special familiarity and use the term.
3. It is a tabooed term in ordinary discourse with persons of higher social status or greater responsibility.
4. It is used in place of the well-known conventional synonym, especially in order (a) to protect the user from the discomfort caused by the conventional item or (b) to protect the user from the discomfort or annoyance of further elaboration.

Sornig (1981) defined slang as the language of 'insubordination' and noted its origins in the nineteenth and twentieth centuries in 'social stress experienced in the speech communities of large cities'. Andersson and Trudgill (1990) noted that no fully adequate definition of slang was then available in the literature. They focused on four characteristics that slang exhibits: it is group related; it is used consciously; it is typical of spoken language and it is, they claim,

not dialect (though slang is itself subject to regional variation). Referring specifically to the language of younger speakers, Bucholtz (2001) defined slang as 'a constantly negotiated set of lexicalised (and often re-semanticised) terms that are ideologically associated with the practices and identities of youth culture'.

History

Though in France, Germany and Turkey, for example, lists of words used by criminals were collected from the fourteenth century, slang is not discernible in the English records before the early modern period. The first inventories of English slangs (historical slang is often referred to by the archaic term **cant** or the French **argot**) were glossaries of terms used by thieves, rogues and vagabonds, compiled by antiquaries or journalists and published as mock-warnings to a respectable readership. Gotti (2002) has described the processes involved in the creation of **canting terms**, which include extensive borrowing from other languages. The codes developed by criminals and other marginals, referred to by Halliday (1978) as **anti-languages**, are not full languages, but provide an alternative vocabulary for an antisocial or stigmatised group of outsiders, limited to expressing the special preoccupations of the group. In the eighteenth and nineteenth centuries the first dictionaries of English slang were published (Green 1997).

Slang and youth

While slang was formerly associated with the underworld, and later the armed forces and institutions such as universities or the English public schools, teenagers and young adults are currently thought to be the most prolific linguistic innovators and users of slang in English.

In the USA, Teresa Labov (1982), Eckert (1989) and Eble (1996) have studied the use of slang by street gangs and high-school and college students, describing its role in defining member categories in the microsocial order and in ethnic demarcations, and its centrality in dynamic social interactions. Slang is also represented in the corpus of London teenage language compiled by Stenström et al. (2002).

Younger slang users are evidently aware of and interested in their own linguistic practices as evidenced by *The Urban Dictionary*, a collaborative user-generated online compilation of over a million items (Damaso and Cotter 2007).

General characteristics

The origination and diffusion of slang begins in a linguistic event in which an individual speaker experiments, forming a new expression, combining pre-existing terms or parts thereof or using pre-existing language in a new way. For the resulting novelty to pass beyond the speaker's **idiolect** (their personal language) there must be recognition and acceptance on the part of an interlocutor (a process which is not merely an act of decoding but may involve pleasurable complicity). Slang is therefore **dialogic**; it requires an active audience, unlike, for instance, poetry, which may be **monologic** – formulated with no specific interaction or interlocutor assumed.

The features ascribed by Halliday (1978) to **anti-languages** apply to modern slangs. These are **lexical innovation** – producing neologisms or reworkings to fill **lexical gaps** in the language; **relexicalisation**, or finding novel terms to replace existing ones, and **over-lexicalisation** or **hypersynonymy**, the coining of a large number of terms for the same or similar concept. Examples are the many nicknames for their weapons of choice used by criminal gangs, and the multiple synonyms – 'carnaged', wazzed', 'hamstered', trolleyed', etc. – for 'intoxicated by drink or drugs' traded by adolescents and young adults.

Slang can be approached by focusing firstly on its social or **sociolinguistic** functions, then on its **lexico-semantic** features, that is the ways in which it manipulates language in terms of structure and meaning.

Functions

There is a consensus as to the principal functions of slang in socialising processes and social interactions. The ability to understand and deploy slang is an important symbolic element in the construction and negotiation of individual and group identities, enabling bonding, affiliation

and expressions of solidarity and engagement. It performs the important function for an in-group of providing a criterion for inclusion of members and exclusion of outsiders. It is at the same time a means (primarily but not only for younger speakers) of signalling 'coolness' and indulging in playfulness.

The slang vocabulary may be part of a self-referential system of signs, a **semiotic** repertoire of self-presentation or stylisation which can also include dress and accessorising, body-decoration, gesture, physical stance, etc. It therefore functions not only as a lexicon or linguistic resource but on an **ideological** level of affect, belief, etc.

Forms

From a **lexico-semantic** perspective slang is of interest in the way it both imaginatively invents and reworks according to the semantic possibilities of a language, and forms expressions according to its morphological potential.

Slang employs the standard processes of word formation in English, among the most common being **compounding** ('pie-hole' for mouth), **blending** ('chill (out)' and 'relax' become 'chillax'); **affixation** ('über-nerd' which is also a rare instance of **borrowing** a term from another language and combining it with an earlier slang term), change of part of speech or **functional shift** ('weirding', behaving erratically); **clipping** ('za' for pizza, 'bab' for kebab), **abbreviation** and **acronymy** ('FOFFOF' for 'fair of figure, foul of face'). For further examples see Sornig (1981) and Eble (1996). Slang makes use of more unusual devices such as respelling ('phat' for *fat* in the sense of *excellent*); punning ('babia majora' for an attractive female, 'married alive' meaning trapped in a relationship); the insertion of a word or element between syllables or **tmesis**, sometimes called **infixing**, as in 'fanfreakingtastic!' It employs phonology-based manipulations such as **rhyme** and **reduplication** ('drink-link', a cash dispenser), and **assonance** or **onomatopoeia** ('clumping', attacking with fists or feet).

Arbitrary coinages – completely unprecedented inventions – are extremely rare and difficult to substantiate: even the most unusual-looking expressions are usually derived from some linguistic precedent: 'bazeracked' and 'bosfotick', UK student synonyms for drunk or exhausted, for instance, employ **phonosemy** or **sound symbolism** and imitate other multisyllabics denoting destroyed, damaged or confounded. Some words of unknown origin become popular – 'gak' for cocaine is one such; others like 'mahoodally', a term used by some London students to mean ugly, remain in limited circulation.

Slang makes extensive use of **metaphorical manipulation**, playing on and with meaning and associations in the mind. Sornig (1981) lists the processes involved, drawing examples from German and other languages. Eble (1996) uses US campus slang to show how a range of rhetorical figures is mobilised in the same way as in poetry or literature. These include **metaphor** ('beast' can denote an aggressive law enforcer, male seducer or unattractive female); **metonymy** ('anorak', later 'cagoule', the supposedly typical garment standing for the earnest, unfashionable wearer), **synecdoche** ('wheels' for a car); fanciful comparison ('as dumb as a box of hair', i.e very stupid); **amelioration** and **pejoration** whereby words acquire a more positive ('chronic' now denotes wonderful) or negative (neutral 'random' comes to mean bad) sense, **generalisation** and **specialisation** in which terms extend or narrow down their meanings so that 'dude' denotes merely a person while 'the man' refers to an agent of oppression; indirect reference whereby 'her indoors' denotes one's wife and 'the chilled article' a cold beer. Peculiar to slang is **ironic reversal** whereby 'wicked', 'sick' and 'brutal' become terms of approbation.

Recording and analysis

Slang is collected today in specialist dictionaries (Ayto 1998; Green 2005; Dalzell and Victor 2006; Thorne 2007), which, with the exception of Thorne, are derived almost exclusively from written sources, an obvious problem in terms of authenticity and contemporaneity for what is essentially a spoken variety subject to constant innovation and, in the case of some elements, rapid obsolescence. Recording slang *in situ* for compilations or as part of research in 'authentic' settings is difficult, in that, as Halliday (1978)

observed, the peer group is, of all the socialising agencies (family, school, workplace), the most difficult to penetrate, and as Lytra (2007) and Frank (1993) describe, from the perspectives of linguist and journalist, respectively, when recorded or interviewed by outsiders speakers may collude with or mislead the investigator, while insiders may not be able fully to objectify the data they are recovering.

Assumptions about slang

That slang is in any way inherently deficient cannot be demonstrated according to linguistic principles. Slang usage is not necessarily 'impoverished', though in many in-groups a small number of items may dominate (quasi-kinship terms, greetings and farewells, terms of approbation, insults, chants) and be repeated constantly. Halliday (1978) used the term **pathological** (more often applied to impaired language or speakers) when referring to unorthodox varieties; Sornig (1981) calls slang a 'substandard' language, and Andersson and Trudgill (1990: 69) perpetuate a questionable if common hierarchical discrimination in observing that slang is 'language use *below* the level of stylistically neutral language usage' (italics mine). Many linguists are nowadays wary of hierarchies of language or of generalising based on the notions of 'standard' or 'nonstandard' varieties, and sociolinguists are finding the negotiating of roles, relationships, status and power through language, at least by young speakers, to be far more subtle and fluid than previously suggested.

Slang users may be virtuosos of style-switching and **crossing** (mixing different ethnic varieties), and may be acutely aware of **appropriacy** – fitting style to context, or may simply use the occasional expression to liven up conversation (many young people of course use little or no slang and Bucholtz (1999) has shown how deliberate avoidance of 'cool' slang can itself be an **act of identity**). They may also question mainly middle-aged researchers' theorising of their behaviour in terms of prestige, power and class, when these are not necessarily realistic constructs for them, and prefer to invoke notions of a shared, dynamic alternative culture with a special claim to 'authenticity'.

Transience is often thought to be a defining characteristic of slang, and there is a rapid replacement rate in certain semantic fields and functional categories, but complete obsolescence generally takes a minimum of several years and some terms remain in the language, still in highly informal usage, for many years ('punk', which was used in the seventeenth century and which now means to dupe or humiliate, is one such), or are recycled, as in the case of the 1960s and 1970s terms of approbation, 'fab' and 'wicked'. Some cryptic slangs, such as those of drug-users, and slang used by those afraid of obsolescence – the fashion and music industries for example – have a very high turnover of vogue terms, but others – those of taxi-drivers and street-market traders for instance – may retain some core elements for a long time. In secondary or generalised slang, too, terms may persist, 'shrink' meaning a psychiatrist and 'dosh', for money being examples.

Conclusion

In a multilingual setting, such as a metropolitan secondary school, where standard forms are not the norm and many different first languages are represented, a shifting, variegated slang may be the most convenient, accessible (and indeed, locally prestigious) shared style of discourse. Slang is an important component of what linguists such as Cheshire and Kerswill (2004) have identified as an emerging social dialect based on 'youth', known as **Multicultural London English** or 'multiethnic youth vernacular'. There are suggestions that this variety may impact significantly upon the mainstream. In future, what might be viewed as part of a developmental phase in socialisation may have to be reconsidered: the abandoning of the language of adolescence that accompanies full entry into the adult social order may no longer take place to the same extent. Slang's users are no longer confined to subordinate cultures and, in that it is not nowadays excluded from general conversation or media discourse, slang, at least secondary slang, is no longer a **stigmatised variety**, yet as part of its function it must retain or at least mimic 'outsider' status.

T. T.

Suggestions for further reading

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www.urbandictionary.com

Sociolinguistics

Introduction

An attempt to offer a definitive delimitation of the scope of sociolinguistics as a discipline may prove inadequate here, as the array of topics sitting comfortably underneath this umbrella term is as wide ranging as it is disparate. Dealing, as it does, with the study of language in its social contexts, sociolinguistic research offers insights both into the structure of languages and the structure of societies. The discipline, therefore, covers a number of topics and uses a multitude of methodological approaches and theoretical frameworks.

For some, **variationist sociolinguistics/ sociophonetics** (associated principally with the work of William Labov) lies at the heart of sociolinguistics as a discipline, and the statistical correlation of structured variation in production patterns with global social variables such as socio-economic class and gender is considered the core area of research in the field. Others take a broader view and in addition to **interactional sociolinguistics** (associated principally with the work of John Gumperz) which examines meaning-making processes in contextualised language use and ways in which speakers signal and interpret meaning in social interaction, fields such as sociology of language, discourse analysis, ethnography of communication, pragmatics and linguistic anthropology, amongst others, are also placed centrally within sociolinguistics. Whether narrowly or broadly viewed, the field borrows from and in turn offers insights for sociology, social theory, anthropology, education, social psychology and more.

What unites practitioners of the various topics in sociolinguistics is an interest in what speakers actually *do*. Naturally occurring speech data, rather than intuitions about how language is structured, constitute the basis for much of what can be described as sociolinguistic study. **Variation in language use**, which is inherent and ubiquitous, is centrally important in sociolinguistics and is not dismissed as free, unconstrained and of little consequence to theory. Analysis of this variation, and of the linguistic and social constraints on it, allow us better to understand how language changes. Consideration of *why* as well as *how* speakers vary in their language use also allows a better comprehension of the nature and functions of language which lie beyond the need to impart knowledge and information.

In this article, I will consider the background to the development of the field before discussing the major methods and models used in sociolinguistic research. I will also outline important correlations that have been established, and finish with a brief reflection on the implications of findings of the field to date.

Background

There exists a long tradition of investigating and describing the ways in which languages vary over space and time, and much of what we consider sociolinguistics today can trace its roots back to attempts to document phonological, grammatical and lexical variation in languages across large areas in the traditional dialectological survey studies (see, for example, the Survey of English Dialects, Orton and Dieth 1962–71); [*see also* DIALECTOLOGY]. The majority of such surveys had objectives and outcomes which are dissimilar to those recognised in sociolinguistic works. Synchronic inter- and intra-speaker variation in linguistic usage in a given location was not the focus of interest in such studies. Rather, using a synchronic snapshot technique, a diachronic approach was taken, and the focus of interest was on what variation, tracked over wide geographical areas, could tell us about historical developments in the language. Traditional dialectological surveys were, therefore, fundamentally concerned with language variation and change, but were not 'socio-' in their foci.

The term 'socio-linguistics' was first coined by Haver C. Currie in 1952, but it was not until

William Labov's seminal work on Martha's Vineyard (1962) and Lower East Side, New York (1966) that the field of study really took shape as a discipline in its own right. The contributions made by Labov, both in these early studies and throughout his career, should not be understated. Much of the rigour and accountability to the data applied in sociolinguistic research today is a direct consequence of innovations and methodological principles proposed by Labov in his various works, and we see his influence in many of the methods and models currently used in sociolinguistic research. I turn now to a consideration of how such research is undertaken. Though an attempt is made to cover the scope of sociolinguistics broadly defined, this is not an exhaustive account and there are inevitable omissions.

Methods and models

A fundamental tool of sociolinguistic research is the **linguistic variable.** This denotes a linguistic unit with two or more variants involved in co-variation with other social and/or linguistic variables. Rather than indicating whether a linguistic feature is present or absent in speech, such a tool allows us to investigate the frequency of usage of a particular form and through quantification and statistical testing allows us to correlate linguistic variation with social variation. Due to questions of linguistic equivalence, rather than morphosyntactic, lexical or discoursal levels, the phonological level of analysis lends itself more readily to analysis using the tool of the linguistic variable. It is perhaps for this reason that the majority of variationist sociolinguistic/phonetic work to date has concentrated on phonological variation and change. A good body of work exists on the morphosyntactic and discoursal levels, but the approach to such analyses, which take function into account alongside form, is becoming increasingly more qualitative than quantitative.

The ways in which the individual speaker varies is also of central importance to sociolinguistics as alterations in the frequency of use of forms in different situations can tell us a number of things. There are different ways of modelling intra-speaker variation which allow different insights into the status of the linguistic forms and also into the social psychological motivations which underlie structured variation. The '**attention to speech**' model (see, for example, Labov 1972) holds that adjustments to the frequency of use of linguistic forms are made depending on how closely the speaker is monitoring their speech. Such monitoring is manipulated through the use of different tasks such as reading aloud (word lists or passages), (semi-)structured interviews and unstructured conversations. Typically reading tasks elicit a more 'formal' speech style containing a higher frequency of prestige forms and fewer stigmatised or localised forms (which are likely to be elicited through the 'informal', conversational speech style during which less attention is customarily paid to speech). Despite the fact that it is the unmonitored speech style, or the **vernacular**, which is considered to be the style of most interest to the researcher, the act of observation can cause a speaker to monitor his/her speech. This is commonly known as the **observer's paradox**.

How much attention is drawn to speech is not the only factor that speakers respond to, and another influential model, the '**audience design**' model (see further Bell 1984), holds that speakers adjust their speech depending on the perceived identities of their interlocutors. This speech accommodation can take the form of convergence whereby speakers adjust their speech towards their audience to seek their approval or express solidarity with them, or divergence where speakers move away from their audience to demonstrate distance.

The way in which the individual speaker is connected to the group is also of interest and can be modelled in different ways. The speaker can be seen as a member of a **speech community** which shares the same norms of usage. This is often reflected in the direction of style shifting as the sense of prestige or stigma attached to particular forms will be shared by the members of the community. Studies which use this model tend to use quantitative, statistical methods of sampling and analysis. The speaker may also be viewed as a member of a **social network** (see further Milroy 1987) or a **community of practice** (see further Eckert 2000)—models which consider the social ties and the communal activities that characterise the individual's

connection to the group, respectively. Studies which employ these models often take an ethnographic approach and undertake participant observation and qualitative analyses of data, and are often felt to provide a deeper understanding of motivations for variable linguistic behaviour.

Numerous other techniques exist for the analysis of attitudes, perceptions and evaluations of variation. The **matched-guise technique**, in which the same speaker reads the same text using different varieties of the same language, and **semantic differential scales**, which measure attitudes along a scale between two bipolar adjectives, allow listeners to evaluate speakers who vary in the varieties they use on a number of social and personal dimensions. **Perceptual dialectology** uses mapping techniques to elicit how language varieties are delimited geographically and evaluated by informants.

Conversational analysis and discourse analysis examine the negotiation of interaction through analysis of the turn taking system and competitive and co-operative discourse strategies. How the conversational floor is managed, how **face** can be threatened or attended to and how meaning, power and politeness [*see* PRAGMATICS] are negotiated in discourse can all be investigated through such analyses.

Code-switching analysis focuses on the functions of and constraints on shifting between more than one language or variety in an interaction, particularly in bi- or multilingual communities [*see* BILINGUALISM AND MULTILINGUALISM]. By investigating the parts of speech that permit switches and the possible motivations for such switches insights are gained into the identity-making and -marking functions of the various codes for the speaker as well as how code-switching relates to the grammar and phonology of each language and how it contributes to conversational management.

Correlations and conclusions

Many sociolinguistic studies have taken global categories such as socio-economic class, gender, age and ethnicity as independent social variables and have found that use of linguistic forms, whether phonological, morphosyntactic, lexical or discoursal, correlate with the social characteristics of the speaker in terms of these global categories. Certain studies investigate the use of particular consonantal features (see, for example, Trudgill 1974), or, using acoustic analysis, plot vowel systems of speakers grouped by social categories such as gender and class (see, for example, Labov 2001). Others examine the use of non-standard morphological, syntactic or lexical forms (see, further, Cheshire 1982). Many of these studies find that the 'standardness' of forms co-varies in systematic ways with the social class and gender of the speaker. Such studies also often find that female speakers tend to be at the vanguard of linguistic change. Rather than concentrating on a single feature or a selection of features, other studies attempt to describe the characteristics of a variety as a whole. One of the best described ethnic varieties is **African American Vernacular English (AAVE)** (see, for example, Thomas 2007). Much is known about the phonological and morphosyntactic features that characterise this variety and an increasing amount is understood of the regional and social variation that exists within the variety.

Studies that use age as a social variable often infer linguistic change in progress from variation in usage revealed between older and younger speakers. Innovative features may be present in the speech of adolescents, for example, but not in the speech of older speakers, whilst relic forms may be present in data from older speakers but not in those from adolescents. Inferences of language change in progress rest on the assumption that a speaker's linguistic behaviour remains essentially the same as they move through adult life. More work is needed to ascertain whether this is in fact the case. Studies which examine how structured variation and **sociolinguistic competence** is acquired in early childhood find that differences which reflect the social variation in the ambient adult population are present in the child-directed speech used by the caregiver, to a greater or lesser extent, depending on the gender of the child (see, further, Foulkes et al. 2005).

Many other studies examine more local categories and socio-psychological variables such as levels of ambition, attitudinal factors, self-identification (see, for example, Mees and Collins 1999; Dyer 2002; Llamas 2009). Again, such factors are found to correlate closely with linguistic behaviour for the most part and indicate

that speakers are able to exploit the variation in language to index an array of social meanings.

The conclusions of all of these studies allow us to increase our knowledge and understanding of the processes of and motivations for language change, how languages and varieties develop or die out, how language signals power and politeness, how speakers demonstrate solidarity and distance through their linguistic behaviour, how particular linguistic forms come to be indexical of varieties or social categories, and how ideologies and prestiges become associated with forms and varieties as a whole.

Implications and insights

Findings from sociolinguistic research have implications as wide ranging as the discipline itself. Education, language planning and policy, forensic speech science, speech and language therapy, marketing, etc., are just some of the fields that benefit from existing and ongoing studies of language variation and change.

If we consider the insights gained from sociolinguistics to date, we can perhaps best summarise them with a *what*, a *how* and a *why:*

- *what:* variation in language use, for the most part, is not free but is constrained by linguistic and/or social factors;
- *how:* analysis of linguistic variation and the social and attitudinal factors which correlate with it allows us to observe how language changes and how meaning is interpreted;
- *why:* beyond the need for comprehensibility, variation in language use is motivated largely by the speaker's desire to indicate allegiance to particular speakers or groups, to demonstrate power or indicate distance from particular speakers or groups, to negotiate and index momentarily salient facets of identities, to do all these things in response to the perceived or actual linguistic behaviour of other interactants and/or (un)seen audience members.

Sociolinguistics is a relatively young but a burgeoning field of enquiry. Its influence on other domains of linguistics, for example, historical linguistics, phonological theory, syntactic theory, experimental phonetics, psycholinguistics, etc., is increasingly felt. As the field becomes ever more sophisticated it stands to reason that future research, particularly that which lies at the interface of other areas of linguistic theory, will enhance our knowledge of the *what*s, *how*s and *why*s of linguistics and will further our understanding of what it means to know and to use language.

C. L.

Suggestions for further reading

Chambers, J.K. (2003) *Sociolinguistic Theory: Linguistic Variation and Its Social Significance*, 2nd edn, Oxford: Blackwell.

Chambers, J.K., Trudgill, P. and Schilling-Estes, N. (eds) (2002) *Handbook of Language Variation and Change*, Oxford: Blackwell.

Llamas, C., Mullany, L. and Stockwell, P. (eds) (2007) *The Routledge Companion to Sociolinguistics*, London: Routledge.

Meyerhoff, M. (2006) *Introducing Sociolinguistics*, London and New York: Routledge.

Speech-act theory

Speech-act theory was developed by the Oxford philosopher J.L. Austin in the 1930s, and expounded in a series of William James lectures that Austin gave at Harvard University in 1955. These lectures, twelve in all, were subsequently published under the title *How To Do Things With Words* in 1962. The theory arises in reaction to what Austin (1962: 3) calls the **descriptive fallacy**, the view that a declarative sentence is always used to describe some state of affairs, some fact, which it must do truly or falsely.

Austin points out that there are many declarative sentences which do not describe, report or state anything, and of which it makes no sense to ask whether they are true or false. The utterance of such sentences is, or is part of, the doing of some action – an action which would not normally be described as simply saying something. Austin (1962: 5) gives a number of examples: *I do*, as uttered as part of a marriage ceremony; *I name this ship the Queen Elizabeth*, as uttered by the appropriate person while smashing a bottle against the stem of the

ship in question; *I give and bequeath my watch to my brother*, as written in a will; *I bet you sixpence it will rain tomorrow*.

To utter such sentences in the appropriate circumstances is not to describe what you are doing: it *is* doing it, or part of doing it, and Austin calls such utterances **performatives** or **performative utterances**, distinguishing them from **constatives** or **constative utterances**, which are used to state a fact or describe a state of affairs. Only constatives can be true or false; performatives are **happy** or **unhappy**. Austin also expresses this by saying that the two types of utterance seem to have value on different dimensions; the constatives have value on the truth/falsity dimension; performatives have value on the happiness/unhappiness dimension.

The criterion for a happy, or **felicitous**, performative is that the circumstances in which it is uttered should be **appropriate**: certain **felicity conditions** must obtain. If a performative is unhappy, or **infelicitous**, something has gone wrong in the connection between the utterance and the circumstances in which it is uttered.

There are four main types of condition for the happy functioning of a performative (Austin 1962: 14–15):

1. It must be a commonly accepted convention that the uttering of particular words by particular people in particular circumstances will produce a particular effect.
2. All participants in this conventional procedure must carry out the procedure correctly and completely.
3. If the convention is that the participants in the procedure must have certain thoughts, feelings and intentions, then the participants must in fact have those thoughts, feelings and intentions.
4. If the convention is that any participant in the procedure binds themselves to behave subsequently in a certain way, then they must in fact behave subsequently in that way.

If any of these criteria are unfulfilled, the performative will be unhappy in one of two ways, depending on which of the criteria is not fulfilled.

If we sin against either (1) or (2), the conventional act is *not* achieved: a person who is already married may go through another marriage ceremony, but this second marriage will be null and void because its circumstances were faulty (1). Or, a couple may go through all of the marriage ceremony except signing the register; the marriage will then be null and void because the ceremony was not carried out completely (2). Cases like these, in which the act is *not* achieved are called **misfires**.

If we sin against (3) and (4), then the conventional act *is* achieved, but the procedure will have been abused. A person may say *I congratulate you* or *I condole with you* without having the appropriate feelings of joy/sadness for the addressee; or they may say *I promise to be there* without having any intention of being there. In such cases, the act will be insincere (3). Or, a person may say *I welcome you* and then proceed to treat the addressee as an unwelcome intruder, in which case they will have breached the commitment inherent in the greeting subsequently to behave in a certain manner (4). Both types of case are called **abuses**: the act *is* achieved, but the procedure has been abused.

So the connection between performatives and constatives is that for a performance to be happy, certain constatives must be true (Austin 1962: 45): for *I congratulate you* to be happy, *I feel pleased for you* must be true.

However, Austin soon begins to question whether the distinction between the truth/falsity dimension and the happiness/unhappiness dimension is really as clear as it first seemed to be (see also Austin 1971), for it seems that not only performatives are subject to unhappiness: surely *All John's children are bald* as uttered when John has no children is just as unhappy as *I give and bequeath my watch to my brother* as written in the will of a person who does not possess a watch.

In each case, certain things are **presupposed** by the utterance; namely, in the first case, that John has children, and in the second case that the will writer owns a watch. These presuppositions fail, they are void for lack of reference. Similarly, *The cat is on the mat* as uttered by somebody who does not believe that the cat is on the mat seems to be just as much abused as *I promise to be there* as uttered by someone who has no intention of being there. Both are unhappy because their **implications** are unfulfilled: the utterance of *The cat is on the mat*

has the implication that the speaker believes that the cat is on the mat just as *I promise to be there* has the implication that the speaker intends to be there. So constatives can be as unhappy as performatives, and the unhappinesses arise for the same types of reason in the case of both types of utterance. Furthermore, performatives seem to be able to be untrue just as constatives. *I advise you to do it* could be considered false in the sense of *conflicting with the facts* if my belief about what is best for you is mistaken. Similarly, *I declare you guilty* conflicts with the facts if you are innocent (at the time, a **correspondence theory of truth** was popular: a sentence was true if and only if it corresponded to the facts) [*see* PHILOSOPHY OF LANGUAGE]. Austin also points out that it is often difficult to decide whether a statement is strictly true or false, because the facts are vague; and if facts are vague, so is the notion of truth which depends on them. He therefore reformulates the concept of truth as a **dimension of criticism**, including, even for declarative sentences, the situation of the speaker, the purpose of speaking, the hearers, the precision of reference, etc., and it is already beginning to look as if, as Austin indeed concludes (see below), all utterances may be performative in some sense (1962: 52):

> In order to explain what can go wrong with statements we cannot just concentrate on the proposition involved (whatever that is) as has been done traditionally. We must consider the total situation in which the utterance is issued – the total speech-act – if we are to see the parallel between statements and performative utterances, and how each can go wrong. So the total speech-act in the total speech-situation is emerging from logic piecemeal as important in special cases: and thus we are assimilating the supposed constative utterance to the performative.

However, it might still be possible to save the distinction Austin set out with; instead of concentrating on the truth/falsity–happiness/unhappiness distinction which is beginning to look unsound, perhaps we can decide whether something is or is not a performative by testing whether 'saying so makes it so'. If I say *I promise*, I thereby promise, whereas if I say *I walk*, I do not thereby walk. A possible test for performatives is therefore the **hereby test**. In the case of performatives it is always possible to insert *hereby: I bequeath – I hereby bequeath; passengers are warned – passengers are hereby warned*. In a constative, it is not appropriate to insert *hereby: I walk – *I hereby walk; I am being watched – *I am hereby being watched*. This distinction, however, is also about to be broken down.

So far, the performatives mentioned have been clearly marked as performatives by containing within them a verb which stands for the action being performed; thus, in saying *I promise*, I am promising (*I do* looks like an exception, but Austin assumes it is short for *I do take this woman/man to be my lawful wedded wife/husband*). However, there are many performatives that do not contain these so-called **speech-act verbs** or **performative verbs**, and that are not even declarative sentences; in many cases, uttering words such as *dog*, *bull* or *fire* constitutes an action of warning just as much as uttering *I warn you that there is a dog/bull/fire*, so we would want to say that these utterances, too, are performatives.

A distinction is therefore drawn between **explicit performatives** and **implicit** or **primary** performatives. Austin believed that the explicit performatives had developed from the implicit performatives as language and society became more sophisticated. Any primary performative is expandable into a sentence with a verb in the first person singular indicative or the second or third person indicative passive, a verb which also names the action carried out by the performative. Austin estimated that a good dictionary would contain between 1,000 and 9,999 of these performative or speech-act verbs, *and one of them will be 'state'*. Consequently, any constative is expandable into a performative: any utterance, *p*, can be encased in an utterance of the form *I hereby state that p*, and the distinction originally drawn between constatives and performatives has now been effectively deconstructed. *Any* utterance is part of or all of the doing of some action, and the only distinction that now remains is between performative and non-performative *verbs*. Performative verbs name actions that are performed, wholly or partly, by saying something (*state*, *promise*); nonperformative verbs name other types of action, types of action which are independent of speech (*walk*, *sleep*). Because

performative verbs are so numerous, Austin hoped that it might be possible to arrive at some broad classes of speech act under which large numbers of more delicately distinguished speech acts might fall. To arrive at these broad classes, he distinguished among a number of **illocutionary forces** that a speech act might have.

The illocutionary force of an utterance is distinguished from its locution and from its perlocutionary effect as follows.

Every time we direct language at some audience, we perform three simultaneous acts: a locutionary act, an illocutionary act and a perlocutionary act.

To perform a **locutionary act** is to say something in what Austin (1962: 94) calls 'the full normal sense'. It includes:

1. The **phonic** act: uttering noises, **phones**.
2. The **phatic** act: uttering noises *as belonging to a certain vocabulary and conforming to a certain grammar;* that is, as being part of a certain language. The noises seen from this perspective are called **phemes**.
3. The **rhetic** act: using these noises with a certain sense and reference [*see* PHILOSOPHY OF LANGUAGE]. The noises seen from this perspective are called **rhemes**.

These three simultaneous acts make up the locutionary act. However, each time one performs a locutionary act, one is also thereby performing some illocutionary act, such as stating, promising, warning, betting, etc. If a hearer, through their knowledge of the conventions of the language, grasps what one is doing, there is **uptake** on their part of the **illocutionary force** of the utterance. The effect the illocutionary act has on the hearer is called the **perlocutionary act**, such as persuading, deterring, surprising, misleading or convincing. Perlocutionary acts are performed *by* saying something rather than *in* saying it.

Austin (1962: Lecture 12) suggests that it is possible to distinguish a number of broad classes or families of speech acts, classified according to their illocutionary force. He suggests the following classes:

- **Verdictives**, typified by the giving of a verdict, estimate, reckoning or appraisal; giving a finding.
- **Excersitives**, the exercising of powers, rights or influence, exemplifled by voting, ordering, urging, advising, warning, etc.
- **Commissives**, typified by promising or otherwise undertaking (Austin 1962: 151–2): 'they *commit* you to doing something, but include also declarations or announcements of intention, which are not promises, and also rather vague things which we might call espousals, as for example, siding with'.
- **Behavitives**, which have to do with social behaviour and attitudes, for example, apologising, congratulating, commending, condoling, cursing and challenging.
- **Expositives**, which make it clear how our utterances fit into the course of an argument or conversation – how we are using words. In a way, these might be classed as **metalinguistic**, as part of the language we are using about language. Examples are *I reply; I argue; I concede; I illustrate; I assume; I postulate.*

Austin is quite clear that there are many marginal cases, and many instances of overlap, and a very large body of research exists as a result of people's efforts to arrive at more precise classifications both of the broad classes and of the subclasses (see, for instance, Wierzbicka 1987). Here we shall follow up Searle's (1969) development of Austin's theory.

Searle (1969) describes utterances slightly differently from Austin's triad of locution, illocution and perlocution. According to Searle, a speaker typically does four things when saying something; this is because, as Searle rightly points out, not all utterances involve referring and predicating – Austin's rheme, which was part of the locutionary act. For example, *ouch* and *hurrah* do not involve rhemes. So the first of Searle's four possible elements of uttering only contains Austin's phone and pheme; that is, it only includes two of the elements of Austin's locutionary act. Searle calls this act the **Utterance act**: uttering words (morphemes, sentences). Austin's rheme, the third aspect of the locutionary act, constitutes an element of its own in Searle's scheme, the **Propositional act**: referring and predicating. In saying:

1. Will Peter leave the room?
2. Peter will leave the room.

3. Peter, leave the room.
4. Would that Peter left the room.

a speaker will **express** the same **proposition** (symbolised as Rp, where R stands for the action of leaving the room and p stands for Peter), their propositional act will be the same, but they will be doing other radically different things too in each case. They will perform one of a number of possible **illocutionary acts**: questioning, stating, ordering, wishing.

Many utterances contain **indicators of illocutionary force**, including word order, stress, punctuation, the mood of the verb, and Austin's performative verbs. Finally, speaking typically involves a **perlocutionary act**: persuading, getting someone to do something, etc.

Having isolated the acts from each other, in particular having made it possible to separate the propositional act from the illocutionary act, Searle is able to home in on the illocutionary act. To perform illocutionary acts, he says, is to engage in rule-governed behaviour, and he draws up the rules which govern this behaviour on the basis of sets of necessary and sufficient conditions for the performance of the various illocutionary acts.

A **necessary condition** for x is a condition which must be fulfilled before x is achieved, but which cannot, by itself, necessarily guarantee the achievement of x. For example, being human is a necessary condition for becoming a lecturer at Birmingham University, but it is not a sufficient condition; other conditions must be fulfilled too.

A **sufficient condition** for x is a condition which will guarantee its achievement but which need not be a necessary condition. For instance, the entry requirements for a course of study might state that candidates must *either* have taught English for fifteen years in Papua New Guinea, *or* have green hair. Either quality would be sufficient for admittance to the course, but neither would be necessary.

The sum of all the necessary conditions for x constitutes the necessary and sufficient conditions for it.

Searle (1969: 57–61) lists the necessary and sufficient conditions for the speech act of promising as follows:

1. Normal input and output conditions obtain (speaker and hearer both know the language, are conscious of what they are doing, are not acting under duress, have no physical impairments, are not acting, telling jokes, etc.).
2. The speaker, S, expresses that p (proposition) in making the utterance, U. This isolates the propositional content from the rest of the speech act on which we can then concentrate.
3. In expressing that p, S predicates a *future* act, A, of S. Clearly it is not possible to promise to have done something in the past; promises proper always concern the future.
4. The hearer, H, would prefer S's doing A to their not doing A, and S believes that H would prefer their doing A to not doing it. This distinguishes promises from threats.
5. It is not obvious to both S and H that S will do A in the normal course of events. If it were obvious, no promise would be necessary, of course.
6. S intends that the utterance of U will make them responsible for doing A.
7. S intends that the utterance of U will place them under an obligation to do A.
8. S intends that the utterance of U will produce in H a belief that conditions (6) and (7) obtain by means of H's recognition of S's intention to produce that belief in H; and S intends this recognition to be achieved by means of the recognition of the utterance as one conventionally used to produce such beliefs. Elucidation of this rather complexly formulated condition can be obtained through a study of Grice (1957), in which Grice sets out the necessary conditions for **telling** as opposed to **getting someone to believe**. There are many ways of getting someone to believe something; but actually to tell someone something depends on that person recognising that you intend to get them to believe what you are telling them by your utterance.
9. The semantic rules of the dialect spoken by S and H are such that U is correctly and sincerely uttered if and only if conditions (1) to (8) obtain.

Conditions (1), (8) and (9) apply generally to all illocutionary acts, and only conditions (2)–(7) are peculiar to the act of promising. Conditions (2) and (3) are called the **propositional-content**

conditions for promising; (4) and (5) are called the **preparatory conditions** for promising; (6) is called the **sincerity condition**; and (7) is called the **essential condition**. To allow for the possibility of insincere promises, condition (6) can be altered to:

6a S intends that the utterance of U will make them responsible for intending to do A.

From this list of conditions for promising, Searle extracts a set of rules for the use of any illocutionary force indicating device for promising. Searle believes that the semantics of a language can be regarded as a series of systems of constitutive rules and that illocutionary acts are performed in accordance with these sets of constitutive rules, so that the study of semantics boils down to the study of illocutionary acts. In discussing the question of linguistic rules, Searle mentions two positions philosophers have taken with regard to them: that knowing the meaning of any expression is simply to know the rules for its employment; this position seems untenable, since no philosopher has apparently been able to say exactly what the rules are; this has led to philosophers adopting the second position – that there are no rules at all. Searle thinks that the failure of the first group of philosophers and the consequent pessimism of the second group are both consequences of a failure on the philosophers' part to distinguish between two types of rule – of thinking that there is only one kind.

In fact, Searle insists, there are two distinct kinds of rule: regulative rules and constitutive rules. But philosophers have tended to think of rules only in terms of regulative rules while, in reality, the rules for speech acts are much more like the constitutive rules.

A **regulative rule** is a rule that governs some activity which, however, exists independently of the rule in question. For instance, the rules of etiquette regulate the way in which we eat, dress and generally conduct our interpersonal relationships. However, the activities of eating and dressing exist independently of the rules; even if I shovel food into my mouth with my knife, thus breaking one of the regulative rules for eating, I am, none the less, eating.

A **constitutive rule**, on the other hand, is a rule which both regulates and *constitutes* an activity. The activity could not exist if the rule were not being followed. These are things like rules for various games such as football and chess. If you do not play football according to the rules, you are simply not playing football; if you move your king more than one square at a time, you are simply not playing chess. Similarly, if you do not use the illocutionary force indicating devices for promising according to the rules, you are simply not promising; thus, in saying *I promise that I did it*, using the past tense, you are not, in fact, promising (you may be assuring).

The rules for the use of any illocutionary force indicator for promising, derived from conditions (2)–(7) above are:

1. Any illocutionary force indicating device, P, for promising is to be uttered only in the context of an utterance or larger stretch of discourse which predicates some future act, A, of the speaker, S.
2. P is to be uttered only if the hearer, H, would prefer S's doing A to their not doing A.
3. P is to be uttered only if it is not obvious to both S and H that S will do A in the normal course of events.
4. P is to be uttered only if S intends to do A.
5. The utterance of P counts as an undertaking of an obligation to do A.

Rule (1) is called the **propositional-content rule**; it is derived from the propositional-content conditions (2) and (3). Rules (2) and (3) are **preparatory rules** derived from the preparatory conditions (4) and (5). Rule (4) is the **sincerity rule** derived from the sincerity condition (6). Rule (5) is the **essential rule**, derived from the essential condition (7), and it is *constitutive* of P. Searle (1969: 66–7) also sets out the rules for the use of illocutionary force indicating devices for the speech acts **request**, **assert**, **question**, **thank**, **advise**, **warn**, **greet** and **congratulate**. In a subsequent article, 'Indirect Speech Acts' (Searle 1975), he goes on to make a distinction between speaker meaning and sentence meaning. The distinction is drawn as part of the solution Searle offers to one of the great traditional problems in linguistic theory: how is it that speakers know when an utterance having a particular mood, say interrogative, functions as a question, and when it does not?

Normally, we expect utterances in the declarative mood to be statements, utterances in the interrogative mood to be questions, utterances in the imperative mood to be commands, and moodless utterances to be responses or announcements. Mood is an aspect of grammar and can be read off sentences in a straightforward way:

I am studying
S P (S before P; mood declarative)
Is that your coat on the floor?
P S
Am I studying?
⌊S⌋ (P before S or S within P; mood
⌊P⌋ interrogative)
Go away
P (no S: mood imperative)
No
(No P: moodless)

But it is obvious that sentence mood does not stand in a one-to-one correspondence to what might be called **sentence function**. Although in many cases *I am studying* may function as a simple statement of fact, in many other cases it might function as a command or request for someone who is disturbing the speaker to go away. Although in many cases *Is that your coat on the floor?* might function as a straightforward question; in many other cases it might function as a request or command for the coat to be picked up, etc. So how do speakers know which function utterances have on various occasions?

Searle begins by drawing a distinction between the **speaker's utterance meaning** or **speaker meaning**, on the one hand, and **sentence meaning** on the other hand. In hints, insinuations, irony, metaphor, and what Searle calls indirect speech acts, these two types of meaning 'come apart' in a variety of ways (Searle 1979: 122).

- In a literal utterance, a speaker means exactly the same as the sentence means, so speaker meaning and sentence meaning coincide.
- In a simple metaphorical utterance, a speaker says that S is P, but means metaphorically that S is R. This utterance meaning is worked out on the basis of the sentence meaning.
- In an open-ended metaphorical utterance, a speaker says that S is P, but means metaphorically a potentially infinite range of meanings, R1–Rn, and, again, these meanings can be worked out on the basis of the sentence meaning.
- In a dead metaphor, the original sentence meaning is bypassed and the utterance has the meaning that used to be its metaphorical meaning.
- In an ironical utterance, a speaker means the opposite of what the sentence means. So the utterance meaning is worked out by deciding what the sentence meaning is and what its opposite is.

In an **indirect speech act**, which is what concerns us here, a speaker means what they say *but means something else as well*, so that the utterance meaning *includes the sentence meaning but extends beyond it*. So, in the case of an indirect speech act, the speaker means what the sentence means but something else as well. So a sentence containing an illocutionary force indicator for one particular type of illocutionary act can be used to perform that act and simultaneously, in addition, another act of a different type. Such speech acts have two illocutionary forces.

For a hearer to grasp both these forces at once, they must: know the rules for performing speech acts; share some background information with the speaker; exercise their powers of rationality and inference in general; have knowledge of certain general principles of cooperative conversation [*see* PRAGMATICS] (see also Grice 1975).

Searle provides an example of how speakers cope with indirect speech acts:

(1) Student X: *Let's go to the movies tonight.*
(2) Student Y: *I have to study for an exam.*

Let's in (1) indicates that a speech act which we might call a **proposal** is being made. Example (2) is a **statement**, but in this context it is clear that it functions as the speech-act **rejection of the proposal**. Searle calls the rejection of the proposal the **primary** illocutionary act performed by Y, and says that Y performs it *by way of* the **secondary illocutionary act**, namely the statement. The secondary illocutionary act conforms to the literal meaning of the utterance, so it is a literal act; but the primary illocutionary

act is **non-literal**. Given that X only actually hears the literal act, but recognises the non-literal, primary illocutionary act, how do they arrive at this latter recognition on the basis of the recognition of the literal, secondary illocutionary act?

Searle proposes that X goes through the following ten steps of reasoning:

Step 1. I have made a proposal to Y, and in response they have made a statement to the effect that they have to study for an exam.

Step 2. I assume that Y is cooperating in the conversation and that therefore their remark is intended to be relevant.

Step 3. A relevant response would be one of acceptance, rejection, counter proposal, further discussion, etc.

Step 4. But their literal utterance was not one of these, and so was not a relevant response.

Step 5. Therefore, they probably mean more than they say. Assuming that their remark is relevant, their primary illocutionary point must differ from their literal one.

Step 6. I know that studying for an exam normally takes a large amount of time relative to a single evening, and I know that going to the movies normally takes a large amount of time relative to a single evening.

Step 7. Therefore, they probably cannot both go to the movies and study for an exam in one evening.

Step 8. A preparatory condition on the acceptance of a proposal, or any other commissive, is the ability to perform the act predicated in the propositional content condition.

Step 9. Therefore, I know that they have said something that has the consequence that they probably cannot accept the proposal.

Step 10. Therefore their primary illocutionary point is probably to reject the proposal.

As Step 8 indicates, knowing the rules for speech acts enables one to recognise that a literal, secondary illocutionary act somehow contains reference within it to a condition for another speech act; and this will be the speech act which is the primary, non-literal illocutionary act performed by the speaker.

For instance, the rules (derived from conditions) for the speech-act **request** are (Searle 1969: 66):

Propositional content rule:	Future act *A* of *H*
Preparatory rule:	1. *H* is able to do *A*. 2. It is not obvious to both *S* and *H* that *H* will do *A* in the normal course of events of her/his own accord.
Sincerity rule:	*S* wants *H* to do *A*.
Essential rule:	Counts as an attempt to get *H* to do *A*.
Comment:	*Order* and *command* have the additional preparatory rule that *S* must be in a position of authority over *H* …

Consequently, there is a set of groups of sentences that correspond to these rules, 'that could quite standardly be used to make indirect requests and other directives such as orders' (Searle 1969: 64). The groups are (I am leaving out many of Searle's example sentences; see Searle 1975: 65–7):

Group 1. Sentences concerning *H*'s ability to perform *A: Can you pass/reach the salt?*

Group 2. Sentences concerning *S*'s wish or want that *H* will do *A: I would like you to go now; I wish you wouldn't do that.*

Group 3. Sentences concerning *H*'s doing something *A: Officers will henceforth wear ties at dinner; Aren't you going to eat your cereal?*

Group 4. Sentences concerning *H*'s desire or willingness to do *A: Would you be willing to write a letter of recommendation for me?; Do you want to hand me that hammer over there on the table?*

Group 5. Sentences concerning reasons for doing *A: It would be a good idea if you left town; Why don't you try it just once?*

Group 6. Sentences embedding one of these elements inside another; also sentences embedding an explicit directive illocutionary verb inside one of these

contexts: *Would you mind awfully if I asked you if you could write me a letter of recommendation?*

That anyone should want to use an indirect rather than a direct speech act may be due to considerations of politeness [*see* PRAGMATICS]: by prefacing an utterance with, for example, *Can you*, as in the case of indirect requests, the speaker is not making presumptions about the hearer's capabilities, and is also clearly offering the hearer the option of refusing the request, since a Yes/No question like *Can you pass the salt?* allows for *No* as an answer.

K. M.

Suggestions for further reading

Austin, J.L. (1971) 'Performative-Constative', in J.R. Searle (ed.), *The Philosophy of Language*, Oxford: Oxford University Press, pp. 13–22.

Mey, J.L. (1993) *Pragmatics: An Introduction*, Oxford: Basil Blackwell.

Saeed, J.I. (1997) *Semantics*, Oxford: Blackwell Publishers.

Searle, J.R. (1971) 'What is a Speech Act', in J.R. Searle (ed.), *The Philosophy of Language*, Oxford: Oxford University Press, pp. 39–53.

Speech and language therapy

Definition

Speech and language therapy is the British label for the activities of members of an independent profession whose concern is with the diagnosis, assessment, treatment and management of a wide range of disorders of communication that affect people from infancy to senescence. The prime interest is with disorders of spoken language, but the profession is also concerned with disorders of written language, especially in adults. Written language in children is usually seen as the responsibility of the teaching profession, but there is often an overlap of interests, and increasingly speech and language therapists contribute to literacy programmes for young children.

Speech and language therapy is a comparatively young profession, developed in the twentieth century. Similar professions exist in a number of countries, although there are some differences in their academic backgrounds and their spheres of responsibilities, as reflected in their different titles: for example, **speech pathologists** in the USA, Australia, New Zealand and the Republic of South Africa, and **logopedists**, **phoniatrists** and **orthophonists** in various European countries. Elsewhere in the world, e.g., Hong Kong and Malaysia, professions are developing where previously the country had relied on speech and language therapists trained abroad. Reciprocal recognition of professional qualifications is limited between countries, although there is a growing exchange of research and therapeutic techniques internationally between practitioners. The profession's international society is the **International Association of Logopedics and Phoniatrics**, founded in 1924.

Historical background

At the turn of the twentieth century there was an increase in the study, interest and knowledge of human behaviour, including speech, and a parallel expansion of knowledge in the medical sciences. For example, work by neuroanatomists such as Broca in France, Wernicke in Germany and Jackson in the UK confirmed the relationship between cortical damage and acquired language disorders [*see* APHASIA and LANGUAGE PATHOLOGY AND NEUROLINGUISTICS]. In the early years of the twentieth century, increased sophistication in neurological studies had established a relationship between areas of cortical damage and aphasia. A framework for describing some of the components of such disorders evolved, but at that time the physicians and neurologists who were interested in speech disorders felt unable to explore methods of remediation and turned to teachers of voice, elocution and singing for help. These early interventionists, realising their lack of scientific knowledge, sought help from eminent members of the medical and allied professions, and accumulated a relevant body of information which they were able to pass on to their own personal students. The first activities of speech and language therapists were based on contemporary studies of neurology and the developing disciplines of phonetics, psychology and a tradition of education (Quirk 1972).

Parallel to this development in medicine, there was a growing interest in speech disorders in children that arose from educationalists specialising in remedial education.

The first speech therapy clinic for children was established in Manchester in 1906 and offered training for stammerers. This was followed by similar clinics elsewhere; in 1911, the first clinic for adults was established at St Bartholomew's Hospital, London, and in 1913 a second clinic opened at St Thomas's Hospital, London. In 1919 the Central School of Speech and Drama, London, in association with the clinic at St Thomas's, started a course for training speech and language therapists. Other courses were started in Scotland and in London.

During the 1930s there were two professional associations of speech and language therapists: one that represented the medical background, and one that was associated with the teachers of voice and elocution. These two associations, which reflected the two main roots of the profession, were amalgamated in 1945 to form the **College of Speech Therapists**, since 1995 named the **Royal College of Speech and Language Therapists**. Speech and language therapy continues to be closely associated with medicine and education both in terms of employment and in the two main approaches to categorising the range of disorders that are assessed and treated [*see* LANGUAGE PATHOLOGY AND NEUROLINGUISTICS].

Since 1975, the profession has been unified under the National Health Service. This followed the recommendations of the **Report of the Committee of Enquiry into the Speech Therapy Services** which, under the chairmanship of Randolph Quirk, was published in 1972. Prior to this time, speech and language therapists had been employed both by educational and health authorities.

Training and professional body

Since 1985, entry into the profession in the UK has been through a three- or four-year undergraduate programme or a two-year postgraduate programme. All degree programmes leading to a qualification in speech and language therapy are accredited by the Royal College of Speech and Language Therapists, and validated by the Health Profession Council for ensuring that every graduate who is certified to practise as a speech and language therapist has reached the required levels of knowledge, expertise and competence. The components of each degree programme vary in emphasis, but all will contain the following subjects: neurology, anatomy, physiology, psychology, education, linguistics, phonetics, audiology, speech and language pathology and clinical studies [*see* LANGUAGE PATHOLOGY AND NEUROLINGUISTICS]. The study of the disorders of communication is based on the study of normal speech and language from development in childhood to decay in the elderly.

Places of work

By the start of the twenty-first century, there were the equivalent of just over 7,000 full-time registered speech and language therapists working in the UK, the large majority of whom were women. In the USA there were 96,000 members of the **American Speech**, **Language and Hearing Association** (**ASHA**), although this number includes audiologists as well as speech pathologists and speech, language and hearing scientists. As in the UK, most American speech and language therapists are women. In the UK most speech and language therapists practise in local-authority health clinics, schools or hospitals. Some are employed by charitable bodies concerned with children with special needs, and an increasing number work in specialised units, for example with adults and children who have physical or cognitive impairments, or with those with hearing impairments. There are also units offering intensive rehabilitation to adults who have language problems following illness or accidents. Many education authorities offer special provision for children with specific language impairment where speech and language therapists will be employed.

Speech and language therapists work closely with a number of other professions, including medical specialists, nurses, other medical therapists, psychologists, teachers, social workers and clinical linguists. They are often part of a rehabilitation team. In all positions, the speech and language therapist remains ultimately responsible for the assessment, treatment and management of disorders of communication, although in cases which are secondary to disease or injury

a doctor will usually retain overall responsibility for the patient's medical care.

Range of interest

Communicative disorders may result from abnormalities of the production or resonance of voice, the fluency of language, or language production, including the articulation of speech sounds, or they may arise from defects of the monitoring system at any level of production. Disorders at any of these levels can have a number of causes: they may be secondary to trauma, illness or degenerative processes (for example, acquired disorders of language such as aphasia and dysarthria); associated with structural abnormalities such as cleft palate; associated with abnormal developmental patterns (for example, delayed language or phonological development); secondary to or associated with other defects (for example, hearing loss or severe learning difficulties); arise from environmental damage (for example, aphonia [loss of voice] or dysphonia [abnormal voice]); or they may be idiopathic, as in stuttering.

A significant number of people in the UK suffer from some type of communicative disorder. It has been estimated that approximately 800,000 people suffer from communication disorders where little or no spontaneous speech is possible, and a further 1.5 million have speech or language which is noticeably disordered (Enderby and Philipp 1986). This figure is now thought to underestimate the population with communication disorders, as a broader range of disorders and client groups are being seen by speech and language therapists. Some communication disorders can be alleviated and require remediation; others are chronic and require management and perhaps counselling. The speech and language therapist is responsible for assessing all those with communication disorders and selecting the appropriate treatment and/or management programme.

Range of disorders

Disorders of voice

Disorders of voice such as **aphonia**, total absence of sound, or **dysphonia**, abnormal sound, may arise from organic causes such as growths on (or thickening of) the vocal folds, hormonal imbalance, damage to the laryngeal nerves, or vocal abuse, or they may arise from idiopathic, unknown, causes. Cases of unknown origin are often referred to as **functional** and may be associated with stress or misuse of the vocal folds. All cases are referred to therapy through ear, nose and throat medical specialists, and close contact is maintained between the speech and language therapist and the surgeon or physician. Assessment of the voice quality and assumptions about the functioning of the vocal folds are made after listening to the voice and, depending on availability, instrumental investigations. Such investigations may include **electroglottography**, which provides information on vocal-fold activity, airflow and pressure measurements, and the use of visual displays of such information. Therapy is aimed at improving the quality of the voice through increasing the patient's awareness of the processes involved in voice production, encouraging optimal use of the voice, and increasing the patient's ability to monitor their own voice. Where stress is associated with the disorder, counselling techniques are added to the programme. Progress depends on the individual's physical and personal characteristics. In certain cases, additional assistance may be offered, such as amplification of the voice, or systems to augment speech.

Disorders of fluency

Disorders of fluency include **disfluency**, which is associated with neurological damage, as well as those with no known cause, termed **stammering** or **stuttering**. Stammering is characterised by one or more of the following: involuntary repetition of sounds, syllables, words and phrases; prolongation of sounds, often involving the closure phase of plosives [*see* ARTICULATORY PHONETICS] and associated with tension; an increase in the number of filled and unfilled pauses; and a relatively higher number of false starts, incomplete utterances and revisions than normal. The position of each disfluency can be described in terms of the phoneme [*see* PHONEMICS] involved and its position within the word, tone unit, phrase or clause. The speaker may also exhibit embarrassment or anxiety and fear

certain words or communicative situations. The severity of disfluency can range from affecting more than 90 per cent of the utterances to less than 1 per cent.

Certain relationships have been observed between the occurrence of disfluency and the unit of speech involved. For example, there is some evidence that disfluency is more likely to be associated with open-class words and with stress and initial position in both words and clauses, but the exact relationship is far from clear. The complexity of the unit of language involved is also thought to exert an influence. There is a large amount of individual variation, and it may be that several different disorders with varying characteristics and arising from different causes are all being referred to as stammering; however, there is no agreement on where causal or symptomatic boundaries might be drawn. Many stammerers experience fluctuating periods of fluency or have fluency behaviour associated with specific situations or environments.

Most stammerers are able to increase their fluency with techniques taught by speech and language therapists, although the maintenance of fluency is often difficult. Discussion of the stammerer's perception of themselves and their speech forms an important component of most programmes. The main influence on approaches to treatment are from psychology (see, for example, Ingham 1984). There has been a limited influence from linguistics, although the discipline of phonetics is becoming increasingly influential with the expanding availability of instrumental measurement of speech production.

Disorders of language

Disorders of language may be acquired as the result of disease or injury, associated with other major deficits in, for example, hearing or cognition; or, as in developmental disorders, occur when the child fails to develop language according to expectations, notwithstanding normal development in other areas. The term 'language disorder' is used as a broad category to include failure to develop, impairment or loss of any level of language production and includes understanding of language [*see also* LANGUAGE PATHOLOGY AND NEUROLINGUISTICS]. Developmental language disorders in children will be considered first.

Language disorders in children

Children may fail to develop age-appropriate syntax, phonology, lexicon or pragmatics or may fail to develop the expected understanding of language while demonstrating other age-appropriate nonverbal cognitive skills. The extent of delay varies. For some children the delay may be slight and quickly resolved; for others the delay may also affect written language and problems with reading and/or spelling may persist for many years; while for yet other children the gap between their expected and actual linguistic abilities is so severe as to prevent them from benefiting from mainstream education. There is limited special educational provision for this small group of handicapped children in the UK, whereas in the USA these children are more likely to be integrated into mainstream education.

From time to time efforts are made to distinguish 'delayed' speech from 'deviant' speech. In practice, speech may resemble that of a younger child in terms of grammatical structures and the repertoire of sounds used, but there are very often differences that arise from the child's greater experience of the world and the influence of other aspects of development. There may also be differences in language use. Some children may produce speech that is both qualitatively and quantitatively different, for example psychiatrically disturbed children, but there seems to be little evidence that this is common for other categories of handicap, e.g., learning disability.

Although the various levels of language are interdependent and the boundaries between, for example, syntax and phonology are fuzzy, the production of speech sounds is often considered separately. Some children are slower than their peers to develop a complete repertoire of phonemes and some of this group seem to have difficulty in controlling accurate movement and timing of the supraglottal [*see* ARTICULATORY PHONETICS] musculature despite the lack of frank neurological impairment. Errors may be at the phonetic level and fluency and vocal quality might also be impaired, although these factors are more usually considered to be characteristic of dysarthria (see below). For this particular group of children, therapy is directed at increasing the child's muscular control and ability to

sequence sounds, rather than explaining or expanding the rule-governed behaviour of phonology and syntax. These disorders are known either as **articulation disorders**, usually affecting one class of sounds, or as **articulatory dyspraxia** if there are more widespread problems. The choice of terms seems to be related to the perceived severity of the disorder, as well as to success in therapy, the first term applying to less severe disorders.

Children with frank neurological impairments involving the central nervous system frequently have disorders of speech arising from impaired muscle movement and control. These speech disorders are known as **dysarthrias** and are traditionally subdivided according to the site of the neurological lesion. Such children often have language disorders as well, either arising from damage to the cortical area [*see* APHASIA], or from a reduction in normal developmental stimulus and experience, or associated with learning disabilities. Abnormal vocal quality and poor control of fluency are frequent in these conditions. In addition, because the neurological and anatomical structures used in speech are the same structures involved in feeding, these children often have disordered feeding patterns. Because of the close relationship between speech and feeding, and because the speech and language therapist often has a uniquely detailed knowledge of the anatomy and neurology of this region, they are often involved in programmes to improve feeding skills. The role of the speech and language therapist in the management of **dysphagia** (difficulty with swallowing) has become increasingly important.

The speech and language therapist's assessment of language disorders is based on their knowledge of the major subjects of the qualifying degree programme, including knowledge of normal development. Medical, sociological and educational factors are considered as well as a characterisation of the child's linguistic abilities. Studies in linguistics, including child language acquisition [*see* LANGUAGE ACQUISITION], as well as psycholinguistics [*see* PSYCHOLINGUISTICS] have contributed to the range of assessment procedures available and to the subsequent treatment programme that will be formulated. Three examples of assessment are **LARSP** (Language Assessment, Remediation and Screening Procedure) (Crystal et al. 1976), which offers a description of the child's surface grammar; **TROG** (Test for Reception of Grammar) (Bishop 1982), which enables the speech and language therapist to examine the child's understanding of certain grammatical structures; and the **Reynell Developmental Language Scales III** (Edwards et al. 1997), an assessment of production and comprehension of lexical and syntactic features of language.

Having characterised the child's speech and language, the therapist strives to teach or encourage or enhance development, often in conjunction with parents and teachers. For the child to reach age-appropriate levels of language, it is necessary for accelerated development to take place. Progress is often slow, intervention taking place over months rather than weeks.

Following the Education Act 1981, speech and language therapists have an increasing involvement with children with learning difficulties, many of whom have a language delay over and above the delay that would be predicted from their mental age. The process of characterising their language is the same as that for normally developing children. For these children, however, it is more appropriate to aim for language that is commensurate with mental rather than chronological age.

Language disorders in adults

Disorders of language in adults arise from diseases or injury although the developmental disorders described above can persist into adulthood. Acquired disorders of language are usually considered under the two main categories of **aphasia** and **dysarthria**: **dyspraxia** or **apraxia** nearly always occurs with aphasia. Aphasia or dysphasia [*see* APHASIA] is a disorder of language arising from damage to the cortex of the brain. Dysarthria is a disorder of sound production which arises from damage to the central nervous system and which can affect production at all levels: air supply, vocal-fold activity, supraglottal musculature including control of resonance. In addition, suprasegmental features of timing, stress and prosody are often involved.

The distinction between these two levels of language is justified in terms of focus of treatment, although theoretically (and clinically in some cases) the boundaries are less clear.

Treatment of dysarthria is aimed at helping the patient make optimal use of residual skills, increasing self-monitoring of speech, teaching strategies to enhance intelligibility, and advising and providing augmentative or alternative means of communication. Aphasia therapy is aimed at other levels of language – phonology, syntax, semantics and pragmatics – and aims to increase the patient's production and understanding of both written and spoken language. As in all speech and language therapy, intervention starts with an assessment of the patient's medical and social background as well as a full description of the language problem. Most of the patients with aphasia or dysarthria seen by the speech and language therapist will have other medical problems, which, with the language problem, are secondary to the injury or disease. Thus the speech and language therapist working with these patients is usually part of a medical team and collaborates with other medical personnel.

Aphasia therapy reflects the major strands of aphasiology, neurology, psychology and, to a much lesser extent, linguistics. Approaches also reflect the underlying theories concerned with aphasia. For example, a **unitary** view of aphasia is associated with therapy which aims to stimulate language activity but does not select any level or process for particular attention. A more systematic approach which focuses on components of language behaviour arises from the detailed psychoneurological approach initiated in the USSR (see, for instance, Luria 1970). A more recent detailed approach has been pioneered in the UK following investigations by psychologists and speech and language therapists who, by series of individually designed tasks, seek to pinpoint which levels, using models of dynamic speech production, are most impaired by the aphasia. A third approach bases therapy on linguistic theory, usually some version of generative grammar, and aims to highlight the constituent relationships in sentences of contrasting structure. In all approaches, both written and spoken language will be used. The prime concern of the therapist will be the individual's present and future need for language; it is also appropriate to consider the patient's social and emotional needs as well as those of their carers.

Dyspraxia of speech is often interpreted as a disorder which lies between the planning processes of language and the execution of speech production (Miller 1986). In most cases it is concomitant with aphasia, which makes the extent of the linguistic influences on this disorder difficult to define. Clinically, exercises aimed at improving muscle strength and coordination often seem inappropriate despite the characteristic phonetic distortions which may resemble certain dysarthrias. Treatment strategies include: a detailed approach to forming individual sounds; focusing on sequencing sounds within words; using context and linguistic contrast; and supplementing spoken with written language.

A third category of language disorder in adults is that associated with dementia. The speech and language therapist is most often asked to help in the differential diagnosis of aphasia and dementia in the elderly and to advise in the subsequent management of such cases, but in a population which has an increasing number of elderly and old citizens, this category is likely to make increasingly heavy demands on speech and language therapy.

S. Ed.

Suggestions for further reading

Crystal, D. and Varley, R. (1993) *Introduction to Language Pathology*, 3rd edn, London: Whurr.

Van der Gaag, A. (1996) *Communicating Quality*, London: The Royal College of Speech and Language Therapists.

Stratificational linguistics

Stratificational theory

In its broadest sense, the term **stratificational linguistics** can be applied to any view which apportions language structure into two or more strata, or layers. In practice, however, the term has commonly been applied to the outgrowth of ideas originated in the late 1950s and early 1960s by Sydney M. Lamb and H.A. Gleason Jr.

Lamb's version began as an elaboration of the theory of levels in neo-Bloomfieldian linguistics first appearing in Lamb's dissertation, a grammar of the California Amerindian language

Monachi (University of California, Berkeley, 1957). The initial idea was refined while Lamb was directing a machine-translation project at Berkeley (1957–64).

By 1964, when Lamb moved to Yale University, he had become aware that Gleason, then at the Hartford Seminary Foundation, had been developing a broadly similar model. As a result of collaboration and interchange, their views came to a rough convergence, though they were never completely unified.

At about the time he moved to Yale, Lamb began to develop a unified notation as an adjunct to his theory. From this work he concluded that linguistic structure consists entirely of configurations of a few basic relationships. One of these was named the **AND** – the syntagmatic relation occurring, for instance, when an idiom like *kick the bucket*, 'die', is seen as a combination of smaller elements *kick*, *the* and *bucket*. Another was named the **OR** – the paradigmatic relation evident, for example, when we enumerate the alternative suffixes compatible with a verb stem like *walk*, including *-s*, *-ed* and *-ing*. Lamb soon began to use a notation depicting such basic relations for all of linguistic structure. At the same time, he realised that linguistic structure consists not of items with relationships between them, as he once believed, but of relationships alone, interconnecting in a network. Since a similar idea had been asserted in the **glossematic theory** of **Louis Hjelmslev** [*see* GLOSSEMATICS], Lamb came to see Hjelmslev's work as a precursor of his own.

Soon afterwards, Lamb concluded that the relational-network structure was more essential to his view than stratification, which he treated as deriving from a confrontation of the relational view with linguistic data. This notion was not shared by Gleason, however, nor by all of those who had based their work on Lamb's model. Since about 1965, the term **Relational Network Grammar** has been applicable to the work of Lamb and some of his followers, particularly Peter A. Reich, who especially favoured this term, but also William J. Sullivan, David G. Lockwood and others. The term 'stratificational' is still needed, however, for the work of Gleason and his students, and others like Ilah Fleming, who has drawn from both Lamb and Gleason, as well as from other sources.

From the late 1960s, Lamb began a serious investigation of how his theory could be related to what is known about the structure of the brain, and this led him to begin to speak of his own version as **cognitive linguistics**. He taught and lectured on this view around that period, but published very little on it until the 1980s. His teaching at Rice University (from 1980 until his retirement in 1998) led to the ultimate publication of Lamb (1999), which presents his view of what he now calls **neurocognitive linguistics**. This modified name was adopted because others (led by George Lakoff and Ronald Langacker) had begun to use the similar term **cognitive grammar** for a view based on semantic considerations, but not relating to neural structure.

Unless otherwise indicated, the present discussion deals with the 'standard' model of stratificational theory. This view, based on Lamb's ideas of the 1970–1 period, was incorporated in D.G. Lockwood (1972). This model treats language as a relational network organised into four primary stratal systems and two peripheral (probably extra-linguistic) systems.

Each primary stratal system has a tactic pattern specifying the arrangements of its units and a realisational portion relating these units to adjacent systems. The four stratal systems are the sememic, treating essentially the linguistic organisation of meanings; the lexemic, treating the internal relations of phrases, clauses and sentences; the morphemic, treating the internal structure of grammatical words; and the phonemic, treating classical morphophonemic relations, but with a componential representation comparable to classical phonemics at its lowest level [*see* MORPHOLOGY; PHONEMICS].

Like the primary systems, the peripheral systems are seen as relational networks, but the organisation of tactic and realisational portions appears not to be as strictly defined in these systems as in the primary ones. These systems link language proper with extra-linguistic matters. Bordering on the sememic system is the gnostemic (or conceptual) system, organising general knowledge. Some more recent views, probably more correctly, allow this system to connect to any of the primary systems, not just to semology, to handle stylistically conditioned alternation. The other peripheral system is the phonetic,

correlating minimal phonological units with phonetic realisations of the classically sub-phonemic type. This system ultimately relates to both articulatory movements and auditory impressions.

Stratificational analysis of a sample sentence

The analysis of a short example on multiple strata is a good way to illustrate the workings of a stratificational analysis. An appendix to D.G. Lockwood (1972: 290–301) treated the English sentence *All the best woodpeckers were shot by Lance's friends*.

Limited space does not permit the reproduction of that example, but briefer discussion of the sentence *All Tom's compact disks were stolen [by a burglar]* is offered here as an updated form.

The semological structure of this example is shown in Figure 1.

On this stratum, the structures are not presented in a linear order. Triangular nodes with all their downward lines coming from a single point are UNORDERED ANDs. This representation includes two sub-varieties of such ANDs: the shaded node is an ASSOCIATIVE AND, marking an association in no particular sequence, while the others are simply SIMULTANEOUS ANDs. The configuration inside the box is the optional part corresponding to *by the burglar*. In the view found in this theory, the relation of classes of verbs to various classes of nominals capable of serving as subjects and/or objects in the same clause with them are treated in the semology. These classes involve such distinctions as concrete/abstract, animate/inanimate and human/non-human. Then the lexology does not have to treat them, because it is controlled by the semology. In addition, provision must be made to treat these patterns essentially as norms, capable of being violated in such contexts as fantasy stories, and not as absolutes. Essentially, those 'syntactic' matters more easily handled in the semiology of a language are treated there, while others, such as the linear order of phrasal constituents, are treated in the lexology.

The corresponding structure on the lexemic stratum is shown in Figure 2.

The most important task of the lexology in any language, specifically of the lexotactics, is to specify the arrangements of words into larger units: phrases, clauses and sentences. On this stratum, the units (lexemes) are mostly given in linear order, which is signalled by ORDERED ANDs, depicted with their downward lines in a sequence corresponding to their order. Unordered nodes are still used, however, for the association of inflectional marks with

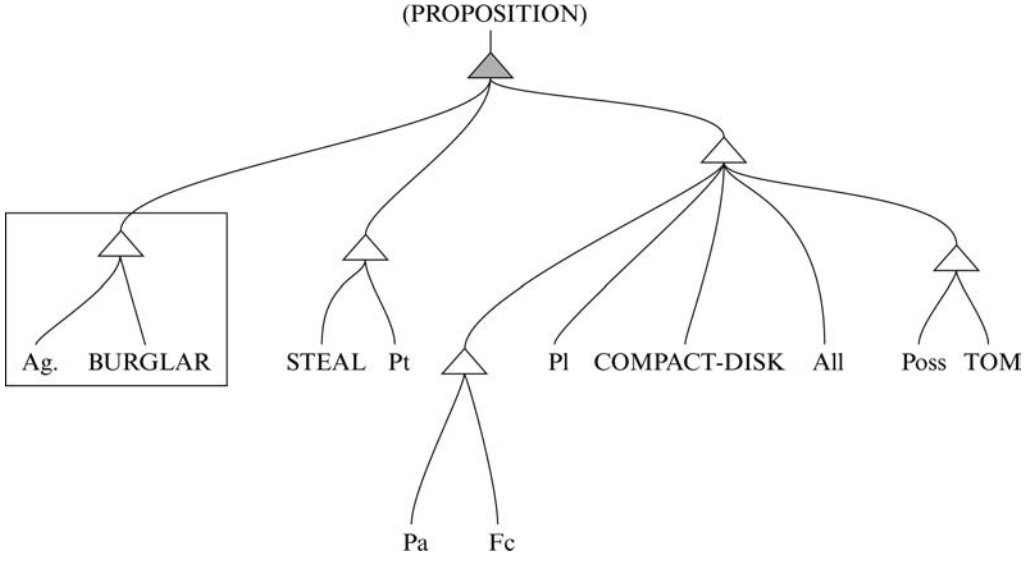

Figure 1

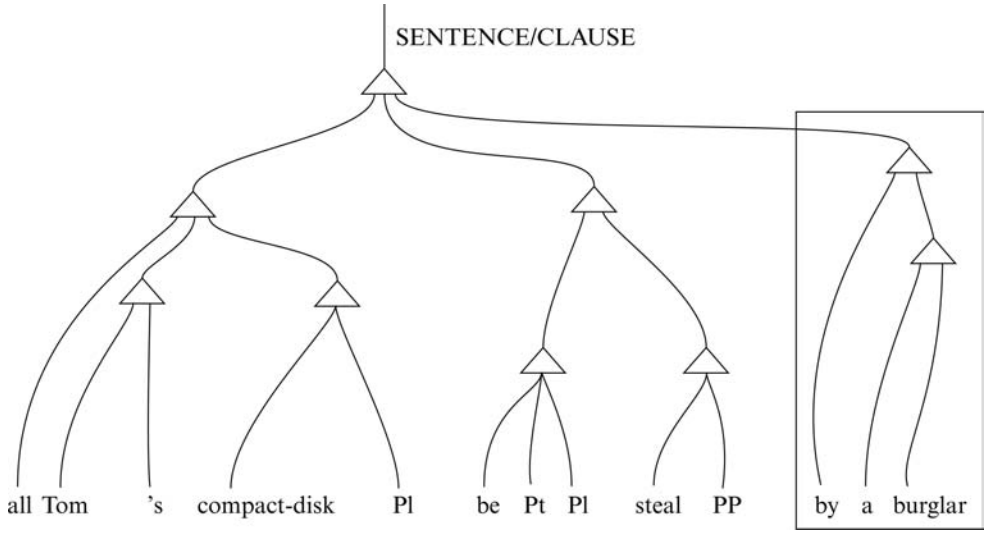

Figure 2

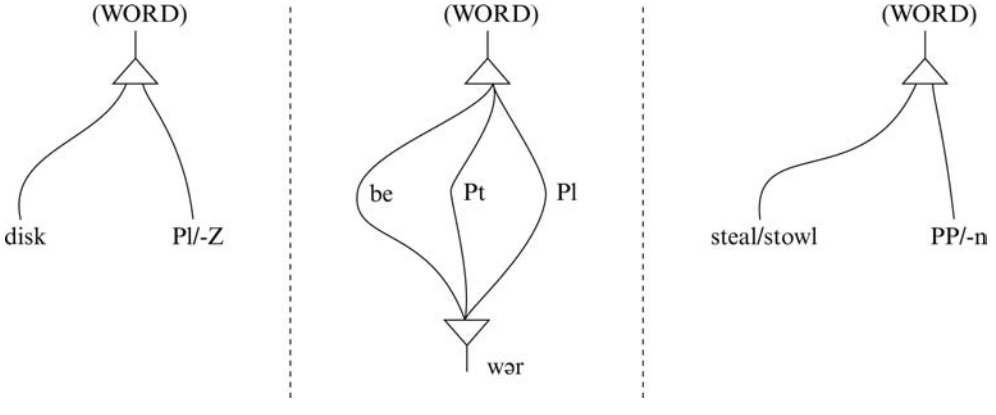

Figure 3

their stems. Again the boxed portion indicates the optional part.

On the morphemic stratum, primary attention is paid to the internal structure of words distinguishing prefixes, suffixes and simulfixes, and specifying linear orders among affixes where relevant. (Any affix which is not a prefix or a suffix is treated as a simulfix, with further distinctions – as between superfixes and infixes – being left to the phonology.) Only some words are shown in Figure 3, because most of the rest have no internal morphemic structure.

Table 1 illustrates the relationships among these three strata in a different fashion, concentrating on the way sememes, lexemes and morphemes line up in various relationships.

In most cases, there is a simple one-to-one-to-one correspondence between adjacent strata, as illustrated by the first three examples. The morphemic representation is generally given in terms of **morphons**, which correspond to one of the classic conceptions of morpho-phonemes. Technically, the combinations of morphons are not morphemes proper, but **morphemic signs**, and there can be alternative morphemic signs for the same morpheme. More complex examples have been assigned numbers and are discussed in the numbered comments below.

Table 1 Realisational relations in the sample sentence

SEMEMIC	LEXEMIC	MORPHEMIC
ALL	all	ɔ l
TOM	Tom	t a m
Poss[essive]	-'s	S
COMPACT-DISK	compact disk	k a m p æ k t d i s k (1)
Pl[ural]	s	z/Z (2)
Pa[tient] & F[o]c[us] (3)	be	
P[as]t	Pt	be & Pt & Pl/wər (4)
	Pl (5)	
STEAL	steal	steal/s t o w l (2)
Pa & Fc (3)	PP	PP/ ə n (2)
Ag[ent]	by	b a y
	a (5)	ə
BURGLAR	burglar	b ə r g l ə r

1. First, we note that there is a single sememe and a corresponding lexeme for compact disk, but ultimately this corresponds to a sequence of two morphemes represented here as ^{M}/k a m p æ k t/ and ^{M}/d i s k/. This is a case of **composite realisation**. In a fuller presentation it would be localised within the lexemic system. This is generally the case for idiomatic phrases whose meaning is different from or more than the sum of the usual meanings of their parts. It can be noted that the sememe, ^{S}/COMPACT-DISK/, is often realised by the acronymic lexeme, ^{L}/CD/, which connects to at least two alternative sememic units: ^{S}/CERTIFICATE OF DEPOSIT/ in the financial realm, and (in the vocabulary of some linguists) ^{S}/COMMUNICATIVE DYNAMISM/ in the realm of discourse studies. The relationships connecting these are diagrammed in Figure 4.
2. There are several cases where two different labels separated by a slash are shown in the morphemic column. This notation is intended to represent the occurrence of **diversification**, also known as **alternate realisation**. Here only the selected alternate has been shown, but the language has other possible ways of manifesting the morphemes for plural, ^{M}/Pl/ and ^{M}/PP/ for the past participle and the verb ^{M}/steal/.
3. In the indication of the passive, there are several complications. Basically, the English passive here involves the mark of the Patient (Pa) (the undergoer) combined with the marked Focus (Fc). Their relationship is one of **portmanteau realisation** within the

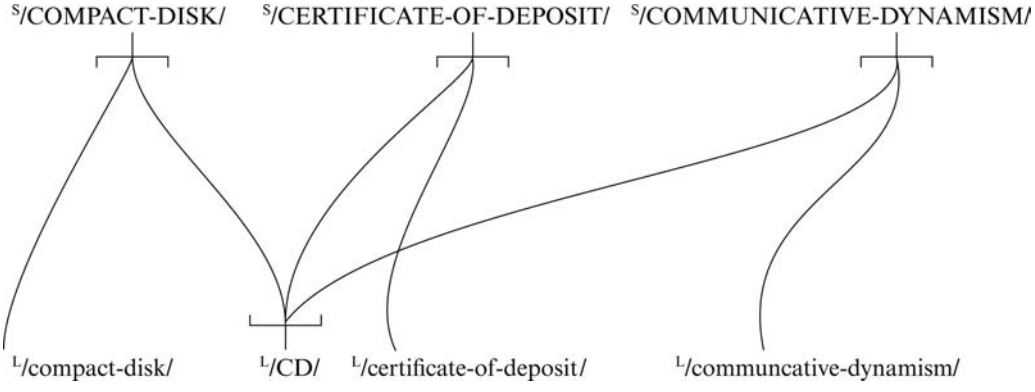

Figure 4

Table 2 Simplified representation of the sample in terms of phonemes and phonons

ɔ	**l**	**+**	**t**	**a**	**m**	**z**	**+**	**k**	**a**	**m**	**p**	**æ**	**k**	**t**	**+**	**d**	**i**	**s**	**k**	**s**	
Vo Lb Lo	Ap		Cl Ap	Vo Lo	Ns Lb	Sp Rz Vd		Cl Do	Vo Lo	Ns Lb	Cl Lb	Vo Fr Lo	Cl Do	Cl Ap		Cl Ap Vd	Vo Dr Hi	Sp Rz	Cl Do	Sp Rz	
w	**ə**	**r**	**s**	**t**	**o**	**w**	**l**	**ə**	**n**	**+**	**b**	**a**	**y**	**ə**	**b**	**ə**	**r**	**g**	**l**	**ə**	**r**
Lb	Vo	Rz	Sp Rz	Cl Ap	Vo Lb	Lb	Ap	Vo	Ns Ap		Cl Lb Vd	Vo Lo	Fr	Vo	Cl Lb Vd	Vo	Rz	Cl Do Vd	Ap	Vo	Rz

Key to symbols: Ap=Apical; Cl=Closed; Do=Dorsal; Fr=Frontal; Hi=High; Lb=Labial; Lo=Low; Ns=Nasal; Rz=Retracted; Sp=Spirant; Vd=Voiced; Vo=Vocalic.

semology. This passive element is in turn realised by two discontinuous lexemes: (1) the auxiliary verb ^{L}/be/ and the past-participle suffix ^{L}/PP/ on the main verb. (It can also be argued that a third part of the realisation of passive is the election of the entity marked as Patient as the grammatical subject.)

4. The single word, *were*, in the morphology is here treated as another case of **portmanteau realisation**, manifesting ^{M}/be/ ^{M}/Pt/ and ^{M}/Pl/ all in one.
5. There are two instances of what is called **empty realisation** in these data. One is the plural concord seen on the verb, and the other involves the occurrence of the indefinite article, *a*. In the first instance, the verb is required by the lexotactics to agree with its subject, so it takes on the Plural (Pl) marker. In the latter instance, some kind of determiner is required, and the lexology supplies ^{L}/a/ when no different specification (such as one for a definite article or a possessive expression) is received from the semology. A fuller account of English would need to deal with special cases when no overt determiner is found, as with mass nouns or plurals, as well as with proper names.

When it comes to the phonology, there is actually a considerable hierarchy to represent, including organisation into what might be seen as intonation units, breath groups and phonological words. In the version shown here, in Table 2, most suprasegmentals have been omitted to keep the presentation fairly straightforward.

What is given is a representation of each phonological word as a string of segments broken down into simultaneous phonological components termed phonons. Segmental phonemic labels have been included for ease of reference and exposition. The plus symbols separating phonological words are kinds of juncture elements, which are viewed as phonemes also. Each segment is shown to consist of between one and three phonons. This is sufficient to distinguish the phonemic segments in English, but some languages may require larger bundles depending on the complexity of their segmental phonology. Phonons are essentially singularly articulatory features. So they are present in the segments marked with them, and absent in other segments: distinctively voiced segments contain ^{PN}/Vd/. Others lack distinctive voicing – meaning that voicing is either distinctively absent (as with ^{P}/p t k/ among others) or predictable (as with vowels and resonants in English and many other languages).

The active example corresponding to the sample sentence is, of course, *A burglar stole all Tom's compact disks*. The sememic structure for this would differ only minimally from that given in Figure 1: it would simply lack the sememe ^{S}/Fc/ marking the special focus. Its lexemic structure in relation to Figure 2 would show greater differences. The same noun phrases used as subject and prepositional 'object' in the passive example would now occur as object and subject, respectively. Further differences on the lower strata would largely parallel those found in the lexology.

Tactic patterns

As mentioned above, the sample representations at each stratum are related to a tactic pattern associated with that stratum, which has the task

of specifying well-formed combinations at its level. As an illustration of the details of such a pattern, we can consider the structure of the English noun phrase on the lexemic stratum. The particular noun phrase examples *all Tom's compact disks* and *a burglar* in the sample above would be among the outputs possible from this structure.

Represented in an algebraic form the structure of this phrase (NP) can be shown as follows:

NP/[PreD] Det [Enum] [M] H_n [Q]

This states that an NP consists of an optional predeterminer ([PreD]), an obligatory determiner (Det), an optional enumerator ([Enum]), an optional modifier ([M]), an obligatory nominal head (Hn) and an optional qualifier ([Q]), in that order. The symbol / can be read here as 'may consist of', though more generally it means 'leads down to'. An optional constituent is enclosed in square brackets, while the space between symbols on the right-hand side of the formula indicates a linear order between the constituents involved.

The sample phrase *all Tom's compact disks* includes three of the possible constituents, predeterminer (*all*), determiner (*Tom's*) and nominal head (*compact disks*). An expansion of it incorporating the other possibilities would be *all Tom's twenty valuable compact disks from Russia*, which adds an enumerator (*twenty*), a modifier (*valuable*) and a qualifier (*from Russia*).

Figure 5 represents the same information as the formula, translated into the relational-network notation.

The fact that the NP relates to the functions at the bottom is represented by the triangular ORDERED AND node below the NP symbol. The optionality of four of these functions is shown by the small circle on the line involved. In such a case, one may either take that line or omit it. The boxed upper portion shows some further connections of the English NP: predicate complement (COMPPR), as in *These are* ***the three men I told you about****;* axis of a prepositional phrase, the traditional 'object of a preposition' (AXISpp), as in *They were in* ***the woods****;* subject (SUBJ) as in ***Some dogs*** *were there;* direct object (OBJD) as in *She gave them* ***some new books****;* and indirect object (OBJI),

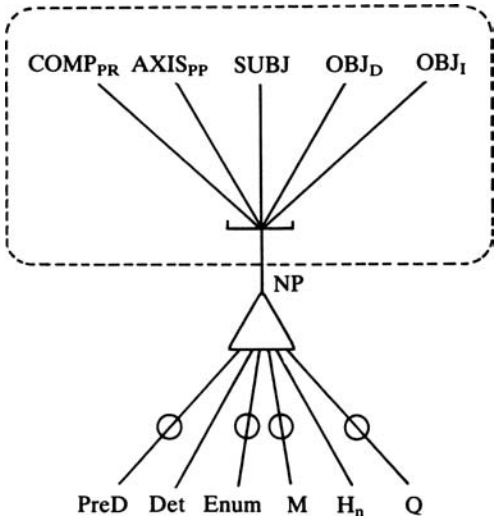

Figure 5

as in *They gave* ***all those boys*** *some money*. The bracket-like node is an UNORDERED OR, indicating alternatives. A given NP may be either a subject or a direct object, etc., but not more than one at the same time.

Relationship to other theories

Views of language have often been classified based on the distinction between item-and-process (IP) and item-and-arrangement (IA) models, as discussed by Hockett (1954).

From the beginning, stratificationalists have strongly rejected the IP view of much traditional grammar and early anthropological description, with its fullest elaboration in versions of the Chomskyan approach. In view of this rejection, it might be thought that stratificational theory is an IA view. While this might justly be said of the earliest versions of stratificationalism, and of the continuing practice of some stratificationalists, it has not been true of Lamb's views since the mid-1960s. Lamb has pointed out that items are not essential in his theory, so it cannot be either IA or IP.

In holding a relational view that sees such linguistic units as lexemes, sememes and morphemes not as substantive items, but merely points in a network of relationships comprising the linguistic system, Lamb allies himself with a

relational tradition in linguistic theory which, through Hjelmslev's glossematics, ultimately traces back to the views of Ferdinand de Saussure.

So the IA/IP distinction, as was indicated in Hockett's discussion, is only a part of the picture. More fundamentally, relational systems differ from item-based ones, and the IA/IP distinction applies only among the latter.

Lamb's refusal to use process in linguistic description does not totally deny the relevance of processes in the language. It recognises, rather, that true processes are relevant in certain aspects of language, but not in describing the structure of the linguistic system. Processes are essential, for instance, in characterising language change, both in a single individual (ontogeny) and for a whole speech community (phylogeny). Language use also involves processes of encoding and decoding. The linguistic system which develops as a result of processes of the second sort is itself a relational system. The invention of pseudo-processes to describe the structure of this system merely makes it harder to deal with the real processes in the aspects of language that involve them. According to some contemporary views based on other theories, however, particularly in the Chomskyan tradition [*see* GENERATIVE GRAMMAR], much of what the standard stratificational model places in three stratal systems – the sememic, lexemic and morphemic – is viewed as part of syntax, including lexicon.

In more recent years, considerable attention has been focused on the distinction between formal and functional approaches to language. The formalists are those, like the Chomskyans, who rely on the supposed power of formalisation to provide explanations for the facts of language, believing that formalisation captures innate properties of the human brain. On the other hand, the functionalists seek to explain language by considering how it functions in actual use, and many functionalists tend to neglect formalisation.

The stratificational approach resembles that of the formalists in insisting on the value of a complete and explicit formalisation of linguistic structure. In line with the functionalists, however, stratificationalists seek explanations for language universals more in function, and function-related diachronic aspects, and less in formalism, which they treat as a foundation for explanation rather than a source of it. Outlines of the standard stratificational models are generally non-committal on this matter, but in practice their advocates usually favour functional explanations.

As already mentioned, Lamb's stratificational model evolved out of neo-Bloomfieldian structuralism with a strong influence from glossematics. It stands apart from the IA/IP dichotomy, since items are not essential for it, though it rejects processes in synchronic description. It is both a formal and a functional model, insisting on formalisation of structures while still emphasising the great importance of functional factors as sources of explanations. In its overall outlook, stratificationalism has a great deal in common with two other contemporary approaches: tagmemics and systemic grammar [*see* HISTORY OF GRAMMAR; SYSTEMIC-FUNCTIONAL GRAMMAR].

D. G. L.

Suggestions for further reading

Annual Forum volumes of the Linguistic Association of Canada and the United States (LACUS) since 1974.

Lamb, S.M. (1966) *Outline of Stratificational Grammar*, Washington, D.C.: Georgetown University Press.

— (1999) *Pathways of the Brain: The Neurological Basis of Language*, Amsterdam and Philadelphia, Pa.: John Benjamins.

Lockwood, D.G. (1972) *Introduction to Stratificational Linguistics*, New York: Harcourt Brace Jovanovich.

Stylistics

Stylistics is the analysis of texts using linguistic description. It does not merely explain formal textual features but aims to show their functional significance for how a text is interpreted. In this sense, the field is closely linked to both critical linguistics and areas of literary criticism. The texts most commonly analysed these days are of a literary nature. For this reason the discipline is often referred to as 'literary stylistics' or 'literary linguistics': the former emphasising the literary critical content and the latter the linguistic substance. Stylistic analysis can be said to have a twofold function: one literary interpretative and

one grammatically pedagogical. The first lies in the ability to draw functional conclusions from formal observations, which, in turn, can lead to increased evidence-based clarity during interpretation. The second rests on the capability to understand how grammatical units function in texts: from phonemes, through phrases and clauses, to sentences. In this second sense, stylistics is an exercise in descriptive linguistics, focusing on constituent analysis. The twofold nature of stylistics becomes clearest of all when performed in situ in the practical domain of the university classroom. This is seen when students of literature are given the opportunity to access grammar and language learning through the comforting medium of literature. The converse process can be observed when language students have access to literary interpretation though the equally reassuring medium of linguistic description. Three things can be said to be important for an adequate understanding of the basic principles of stylistics. The first concerns where the original notion of style comes from and how it relates to modern stylistics; the second pertains to the historical development of the discipline, especially in the past 100 years; and the third focuses on the methods used in contemporary stylistic scholarship and how they are being expanded on.

Stylistics is centrally concerned with the study of linguistic **style**. Style has always been, and still is, a slippery concept. Etymologically the word derives from the Latin *stilus* which was an ancient writing implement. However, this concrete object played little or no role in the more abstract sense of style as the Roman rhetoricians knew it. For them, style – or elecutio as they called it – was the third of the five **canons of rhetoric** [*see* RHETORIC]. The canons constituted an essentially linear model for producing and performing persuasive acts of discourse. First, one generated and/or located arguments. Second, one arranged them for their best rhetorical outcome. Third, one stylised them with such linguistic devices as style figures – or one adopted an appropriate high, middle or low style, depending on the discourse context. Thereafter one memorised and performed the discourse act itself: these constituted the fourth and fifth canons. The groundwork for the first three canons had already been laid in pre-Roman times by the Greek teachers of rhetoric: not least by Aristotle in his *Art of Rhetoric* completed in c. 333 BC. Although the main drive of that work focused on the generation of arguments for the three main **genres of oratory**: deliberative, forensic and epideictic discourse – performed within a framework of logical, pathetic and ethical appeals – these political, legal and eulogistic texts were also exposed to a treatment of style. In the section on style in the *Art of Rhetoric* – known as lexis or phrasis by the Greeks – Aristotle deals with clarity, amplitude, propriety, rhythm, syntax and metaphor. He also discusses suitability to genre. These are concepts still relevant to modern stylistic scholarship. This late, essentially anti-Platonic, stylistic addition to his rhetorical handbook paved the way for the publication of *On Style*, thought to be written shortly afterwards by Demetrius of Phaleron, erstwhile despot and former student of Aristotle and Theophrastus at the Athenian lyceum. This work would be the first – of which we know – that focused exclusively on style genres and style figures.

Style figures usually divide into the categories of schemes and tropes. This division, however, is not absolute and there is often confusion as to what belongs where. Despite this, **schemes** are broadly concerned with deviations in syntactic structure, involving a transfer of order; while **tropes** often constitute deviation in semantics, entailing a transfer of meaning. Schemes can be categorised in different ways, such as ones of balance, inverted word order, omission, repetition, etc. Similarly, tropes can be grouped by metaphor-type figures (e.g., similes, oxymora, etc.), puns or word plays. Other more general groupings can also be made, such as ones pertaining to brevity, description, emotional appeals, etc.

The ultimate elusiveness of style, alluded to at the beginning of this section, lies in the age-old debate as to whether style is extrinsic or intrinsic in nature; whether it is the icing on the cake – in effect, an optional extra – or whether it is an inherent part of the cake itself. Although no definite, all-encompassing answer can be given to this question, most contemporary views on this form/content debate support the idea of inseparability. Style, it would therefore seem, is not an optional extra in linguistic exchanges; rather it is part of the essence of communication itself.

In light of the above, through rhetoric, stylistics can thus be said to have its roots in the classical world. This is in spite of the fact that rhetoric is primarily concerned with structure and production, while stylistics is mainly occupied with analysis and reception. The more modern roots of stylistics, however, are in the twentieth century and start at the very beginning of linguistic scholarship. Ferdinand de Saussure's seminal structuralist work on the nature of language influenced one of his students, Charles Bally, to publish a two-volume treatise on stylistics in 1909 entitled *Traité de Stylistique Française*. In the period that followed very little was published in the West on stylistics. The only notable exception was Leo Spitzer's work *Stilstudien* presented in 1928, which would not appear in English, in a somewhat reworked form, until twenty years later. The real breakthrough, however, in the English-speaking world, came at the beginning of the 1960s with the translation and publication of Roman Jakobson's work on language communication. Jakobson started as a Russian Formalist back in 1916. There he worked with Viktor Shklovsky, who claimed in his work that the function of art was to make people see the world in new and exiting ways through a process of **defamiliarisation** (*ostranenie*). Another influential member of this group was Vladimir Propp, whose focus was primarily on the narrative structure and morphology of texts and in particular folk tales. Jakobson's focus was on poetic functions and speech events. He claimed that there are six basic **functions of any communicative act**. In any situational context there is an addresser who sends a message to an addressee. This process involves a code and is moderated by the contact supplied by voice quality and gestures. The dominant functions of these six elements are:

1. referential (context, i.e. the non-linguistic world);
2. emotive/expressive (addresser);
3. poetic (message, i.e. the surface structure);
4. conative (addressee);
5. metalingual (code);
6. phatic (contact).

Forced to flee from the intellectual constraints imposed by totalitarianism, Jakobson left Russia to work with the Prague School, also known as the Prague Linguistic Circle. He remained there throughout the 1920s and 1930s. These Czech scholars were influenced heavily by the structuralism of de Saussure. One of the most significant methodological advances made by this group in the context of stylistic scholarship was the notion of **foregrounding** (*aktualisace*), developed by Jan Mukařovský, which highlighted the **poetic function of language** and its ability to deviate from the linguistic norm and also to create textual patterns. This, of course, not only built on Shklovsky's earlier work on 'making strange' but was, in effect, a modern description at a meta-level of the basic workings of classical schemes and tropes. It also tied in with the emerging **Gestalt psychology** of the time and its focus on the perception of figures set against grounds. Forced to take flight once again, this time from a different kind of totalitarianism, Jakobson left Czechoslovakia in the late 1930s bound for the USA where, in time, his life's work would be translated and disseminated throughout the English-speaking world.

For much of the twentieth century, stylistics was primarily a formal affair with the text and the language playing a dominant role. This is not surprising since stylistics can be said to take its major methodological prompts from both literary and linguistic scholarship as, in a sense, it is sandwiched in between the two disciplines. So, for example, when the textualism of new criticism and the universality of transformational grammar were dominant in the middle of the twentieth century, stylistics too, in turn, became a primarily formal matter as it emerged in the 1960s (see, e.g., Thorne 1965). Likewise, in the 1970s when textual literary scholarship gave way to phenomenology and reader response, approaches and linguistic theory started to explore the realms of functionalism, so too did stylistics start to look not just at the text but at the context too. This eventually led to a number of publications in the field of stylistics that emphasise the importance of the text-context analytic continuum (see, e.g., Verdonk 1993; Verdonk and Weber 1995; Bex, Burke and Stockwell 2000). A contextualised approach to stylistic scholarship started by considering what might be termed the socio-cultural context of any given reading situation. Key questions here pertaining to the text

are: Who speaks? To whom? Where? When? How? etc. Notions like deixis, point of view and social relationships start to play a role here. However, as linguistic scholarship moved from functionalist approaches to cognitive ones at the end of the twentieth century, this allowed an extra contextual dimension to be explored. This pertained to what goes on in a reader's mind and body when they read. Logically, the introduction of a cognitive dimension would eventually have to lead to that which is most central to the processing of an affective object like a literary text: human emotion.

There are many analytic works that admirably cover the methodology of late-twentieth-century stylistics. The most widely read of these include Leech and Short's *Style in Fiction* (1981); Carter and Nash's *Seeing through Language* (1990); Short's *Exploring the Language of Poems, Plays and Prose* (1996) and, most recent of all, Simpson's *Stylistics* (2004). **Approaches to stylistics** that have been adopted in this period include:

1. **discourse stylistics**, which opened the way for sociolinguistic and pragmatic input into stylistics (see, e.g., Carter and Simpson 1989);
2. **critical linguistics/stylistics**, which draws heavily on the Hallidayan toolkit from systemic grammar to look at how social patterns of language can influence how it is perceived and understood (see, e.g., Fowler 1986);
3. **pedagogical stylistics**, which focuses on how stylistic analysis can function as a literary and linguistic learning aid by both non-native and native speakers of the language (see, e.g., Widdowson 1992; Clarke and Zyngier 2003).

There has been critique of stylistics too in this period; some quite vociferous, yet still constructive. An example of this is Stanley Fish's observations in his 1973 work on his developing notion of affective stylistics. There he suggests that stylistics still tends to rely all too heavily on narrow textualism and in doing so ignores the crucial effects to meaning making and interpretation that a text has on the mental processes of a reader; and also the cognitive output that readers bring to bear on texts.

Of essential importance to understanding what stylistics is and how it works is its methodologies. When a stylistician sits down to conduct a stylistic analysis they can choose any number of tools from the extensive linguistic-stylistic toolkit that is at their disposal. These are then brought to bear on a text through a close analysis of the language and style in order to draw out meanings that otherwise might have remained hidden. There is no definitive list of stylistic tools that the analyst can employ. One of the most simple and most effective is a foregrounding approach, similar to that described by Mukařovský, which seeks to highlight noteworthy linguistic patterns in a work and then move, in a responsible scholarly fashion, from description to interpretation and finally to evaluation. Such patterns pertain primarily to the three notions of **deviation**, **repetition** and **parallelism**. The first stresses the idea of 'making strange', while the second teases out the idea of both a sense of continuation and one of diversion through over-regularisation. Deviation can also occur internally or externally: the former referring to there being some marked alteration in an established pattern within the text, while the latter pertains to some violation of an excepted generic external norm. The third foregrounding notion, parallelism, is a phenomenon that, like the other two, appears to give humans great pleasure from both noticing and discovering parallel patterns at many levels of sensual appraisal: visual, auditory, tactile, etc. Short offers an explanation with his 'parallelism rule' as to what this might entail: 'what is interesting about parallel structures, in addition to their perceptual prominence, is that they invite the reader to search for meaning connections between the parallel structures' (1996: 14). He adds that 'parallelism has the power not just to foreground parts of a text for us, but also to make us look for parallel or contrastive meaning links between those parallel parts' (Short 1996: 15). There appears thus to be fundamental invitational, emotive essence to parallelism that readers/listeners can pick up on and are seemingly enchanted by. This was something not lost on the style experts of the distant past. As classical rhetoricians Corbett and Connors state in their discussion on style figures 'repetition is one of the characteristics of highly emotional language' (1999: 392).

Deviation, repetition and parallelism need not occur exclusively or in isolation. Indeed several

linguistic observations within longer discourse units may involve two or more dimensions. This can be illustrated as follows. Towards the end of J.F. Kennedy's famous inaugural speech, he impresses upon his listeners 'ask not what your country can do for you; ask what you can do for your country'. On the face of it, at a meta-level, this is essentially the style figure of **antithesis**; a juxtaposing of contrasting ideas often in parallel structure. At a more detailed level, it might be seen as the scheme of **antimetabole**: a repetition of words in successive clauses in a reverse grammatical order. What is important, however, is that this piece of discourse involves not just repetition and parallelism but the necessary deviation from those norms in order for it to be able to function antithetically. Hence, all three aspects of foregrounding are present here, albeit to a greater or lesser extent.

This general highlighting of linguistic patterns can be conducted in a systematic way by proceeding from some of the smallest units of language to some of the largest. This can include looking at foregrounding at the levels of phonetics, morphology, graphology, meter, lexis, semantics, syntax, discourse and pragmatics. In a similar fashion to the three kinds of foregrounding discussed above, a stylistic observation need not belong exclusively to one linguistic level but may fall simultaneously into two or more domains. For example, a word might be foregrounded simultaneously at levels of lexis, semantics and graphology. In such cases the stylistician should take care to report this accurately. Once these two lists of foregrounding types and linguistic levels have been learned, they can be committed to memory and deployed as a heuristic by the stylistician in a not too dissimilar similar way to how the ancient orators used their own rhetorical checklists to generate arguments at the levels of discovery, arrangement and stylisation.

In addition to conducting a foregrounding-orientated analysis, there is also a whole host of discourse analytic and pragmatic linguistic theories and models that can be employed in stylistic analysis either independent of, or in tandem with, foregrounding. Such models include the speech-act theory of Austin (1962) and Searle (1969); the politeness theory of Brown and Levinson (1987); and the relevance theory of Sperber and Wilson (1986). Examples of how such models can be applied within an analytic stylistic context include: Hurst (1987) on speech acts; Simpson (1989) on politeness; and Clarke (1996) on relevance theory. Other linguistic models and theories that can be applied in stylistic analysis include for example deixis (see, e.g., Green 1992); mind style (see, e.g., Bokting 1994); and speech and thought presentation (see, e.g., Aristar Dry 1995).

Stylistics scholarship is flourishing. This can be observed from both a formal perspective and a practical one. Formally, a number of readers have emerged of late that catalogue seminal essays on stylistics, from the days of Jakobson to the present (see, e.g., Weber 1996). Moreover, Wales's influential *Dictionary of Stylistics* (1989) has recently undergone revisions and expansions to keep the increasing number of scholars who are interested in the field abreast of ongoing developments. This culminated in the publication of a second edition of the work in 2001. The fact that the number of stylisticians is growing can be observed in a number of phenomena including the expanding memberships of stylistics organisations like one of the largest: the International Poetics and Linguistics Association (PALA).

From a functional perspective, the thriving state of stylistic scholarship can be observed in a recent proliferation of new sub-disciplines, including feminist stylistics/narratology (e.g., Mills 1995; Page 2006) and corpus stylistics (e.g., Semino and Short 2004). Drawing on stylistic tools, as well as narrative and critical discourse analysis ones, **feminist stylistics** builds on earlier work done in feminist literary criticism to provide a gender perspective for the critical analysis of literary and other texts. **Corpus stylistics**, a development out of computational and corpus linguistics, uses large text corpora, such as the **British National Corpus (BNC)**, with concordancers, such as **Wordsmith**, in order to gain empirical insights into language usage and patterning. Corpus stylistic methods can also be a tool in pedagogical stylistics. Other sub-disciplines include the use of stylistics as a pivotal instructive tool in creative writing teaching. As Simpson has recently observed 'stylistics often forms a core component of many creative writing courses, an application not surprising given the discipline's emphasis on techniques of creativity and invention in language' (2004: 2).

An example of this involves using the threefold matrix of rhetoric, stylistics and creative writing. In such a system students are first given the opportunity to comprehend how a style concept works. This takes place mainly during the sessions on rhetoric. Thereafter, they are stimulated to deploy the stylistic concepts they have learned in the context of analysing acclaimed literary works and record their effects. This is the analytic/stylistic part of the procedure. Lastly, they are asked to (re)produce those concepts in a similar creative discourse environment of their own design and seek third-party feedback on the intended effects that they, as the author, hoped to achieve. This seemingly new idea of employing stylistics in a creative writing-cum-language proficiency fashion is in fact grounded in the classical world of rhetoric where the story of stylistics begins. The comprehension-analysis-synthesis-production trajectory also reflects recognised pedagogical thinking, as originally set out by Benjamin Bloom in his cognitive taxonomy of educational learning (1956), a method still prevalent in higher education today. Perhaps the most prolific of all the new sub-disciplines, however, is cognitive stylistics. As such, this warrants a more detailed discussion.

Cognitive stylistics attempts to describe and account for what happens in the minds of readers when they interface with (literary) language. It focuses on a variety of texts that appear in all kinds of social domains. It is, however, most readily and most often applied to the analysis of literary texts, ranging in fiction types from the popular to the canonical. Cognitive stylistics is thus crucially concerned with reading, and, more specifically, with the reception and subsequent interpretation processes that are both active and activated during reading procedures. Hence, at its core, cognitive stylistics sets out to answer two main questions: 'what does a person do when they read?' and, 'what happens to a reader when they read?' Implicit in these questions is the role that unconscious and conscious cognitive and emotive processes play when an individual or group of individuals read a text that has been purposely designed with the aim of eliciting certain emotions in a reader.

The major difference between mainstream literary stylistics and the sub-discipline of cognitive stylistics is that whereas the former focuses largely on language, style and other formal linguistic aspects of processing, the latter expands on these stimulus-driven processing features and also considers the cognitive, affective and mnemonic aspects of concept-driven processing. This addition is something that literary stylistics had not previously dealt with in any systematic or meaningful way, as Fish had remarked upon in his earlier criticism. Notwithstanding the important role that literary stylistics has played, the field of cognitive stylistics has also been influenced by other academic disciplines, some of which are from outside the humanities. The most relevant of these are cognitive psychology, discourse psychology and cognitive linguistics.

Cognitive stylistics builds on the linguistic-analytic rigour of literary stylistics by attempting to account for and describe the cognitive and mental processes that underpin and channel aspects of meaning-making. This is especially the case in the reception of written (literary) language. As Semino and Culpeper put it, 'cognitive stylistics is the way in which linguistic analysis is systematically based on theories that relate linguistic choices to cognitive structures and processes' (2002: ix). In effect, therefore, cognitive stylistics is indeed centrally concerned with trying to describe, define and account for the role of cognition and emotion in reading procedures. In this sense it can be seen as a kind of discourse psychology for the humanities: a search for the cognitive and emotive sources of aesthetic persuasion for inter-subjective ends, rather than exclusively for sociological ones.

The term 'cognitive stylistics' is also used interchangeably – and oftentimes somewhat confusingly – with '**cognitive poetics**'. One of the purported reasons why such a distinction needs to be made is that those doing cognitive poetics tend to exclusively use the theoretical frameworks that have been developed in the cognitive linguistic tradition of the American West Coast scholars (e.g., Lakoff and Johnson 1980; Lakoff and Turner 1989; Turner 1991, 1996), while those doing cognitive stylistics will use these frameworks, but will also draw on models and methodologies from cognitive psychology and discourse psychology. Another supposed reason is that the proponents of cognitive poetics will only analyse works of literature, while those doing cognitive stylistics will examine

various kinds of texts, just like mainstream stylistics does. Despite there being some limited truth in the claim that cognitive approaches to stylistics and poetics are dissimilar, this distinction appears to be far more theoretical than it is factual. In practice, there is no substantial divide in the work discussed above currently being conducted under these two labels. This can be seen in a number of ways. One is the fact that cognitive linguistics is itself, to a significant extent, grounded in the work of cognitive psychology. An example of this is Rosch's 1975 work on prototypes and categories that formed the base for similar work conducted later in cognitive linguistics. Correspondingly, one can also point to the much earlier Gestalt psychological roots of figure and ground analysis, which has informed and shaped certain aspects of cognitive linguistics, especially cognitive grammar.

All in all, the term 'cognitive stylistics' seems to be preferable. This is the case for at least two reasons. First, by using the term stylistics the focus on the importance of the crucial bottom-up aspects of style in meaning-making is not lost, which is always a possibility in any study of language once the term cognition has entered into the equation. The use of the label 'stylistics' therefore reflects the constant need to pay attention to the relationship between bottom-up and top-down processes in reading procedures, and not to lose sight of the textual input completely. Hence, 'cognitive stylistics' strikes an optimum balance, as the first term covers the mind-fed aspects of processing, while the second accounts for the sign-fed ones. The result of this is a focus on that which truly matters, namely, attempting to observe, describe and define not just the relationship but also the interaction between the two processes in diverse reading contexts. By comparison, the idiom 'poetics' does not seem to adequately capture or represent the formal nature of language and style that must be addressed in any analysis employing linguistic-stylistic criticism. Moreover, using the term 'cognitive stylistics' allows a clear distinction to be made between the current field of study, as sketched out above, and Reuven Tsur's influential, yet very different work, which already operates under the label of cognitive poetics and has done for some time (see, e.g., Tsur 1992).

Despite the relative newness of the sub-discipline, there have already been a number of engaging works produced. These include Stockwell's (2002) introductory, monographic work, which describes and applies a number of cognitive stylistic tools to a diverse range of literary texts. Other works include the edited volumes by Semino and Culpeper (2002) and Gavins and Steen (2003); the latter of which is a companion volume to Stockwell's work. In both these edited volumes, and in a number of journal articles, scholars draw on different sources to produce cognitive stylistic, analytic frameworks. These include ideas from (1) cognitive linguistics, (2) text, discourse and narrative theories, and (3) artificial intelligence. Works that have focused on the first of these include analyses of cognitive metaphor (Crisp 2003); cognitive parable (Burke 2003); cognitive grammar (Hamilton 2003); mental spaces (Semino 2003); figures and grounds (Stockwell 2003); prototypes and categories (Gibbs 2003), etc. The second, 'discourse, text and narrative'-based group includes, for example, cognitive stylistic work done on plot reversals in narrative texts (Emmott 2003). This study is grounded in Emmott's earlier (1997) monographic work, which, drawing on insights from discourse analysis, considers how readers construct and maintain mental representations of fictional characters and contexts. A further example in this discourse category is Gavin's (2003) article that looks at difficult and bizarre reading conditions. The main theoretical model that Gavins relies on is taken from Werth's (1999) monographic work on '**text world theory**', which seeks to provide a replicable framework where entire texts can be systematically analysed. Such discourse-based approaches, which attempt to look at whole texts instead of just text fragments, have been influenced by studies in both narrative discourse and discourse psychology. Third, and last, there are cognitive stylistic studies which have taken their cue from artificial intelligence. The majority of these find form in schema theory analyses (see, e.g., Cook 1994; Semino 1997).

Cognitive stylistics is still very much in its formative years. What happens in the brain, mind and body of a reading individual when they interface with a text, and especially a literary text that has been designed thematically and

stylistically to try and emote the reader, is not a question that is going to be answered either quickly or easily. Theoretical advances in cognitive linguistics, cognitive psychology and discourse psychology, as well as ones in artificial intelligence and also neuroscience, will undoubtedly drip-feed into cognitive stylistics as they develop, thus helping to illuminate the interactive roles that stimulus-driven and concept-driven processes play in a variety of subjective and inter-subjective literary discourse processing situations. In this light, one can see that whereas literary stylistics was mainly concerned with language and literary studies, cognitive stylistics has added a third and crucial psychological dimension to this binary matrix, namely the field of cognitive neuroscience.

With this addition, the potential danger emerges that cognitive stylistics may drift too far away from its stylistic and linguistic roots, which in turn might be read by some as a threat to the existence of mainstream stylistics (see, for example, Downes' 1993 criticism). Recent studies, however, have gone some way to allaying such fears by showing, in stylistic analytic practice, how linguistic and cognitive approaches to stylistics are not contrary but complementary (see e.g., Burke 2005, 2007). These studies show how an added cognitive dimension supplements rather than supersedes a traditional stylistic analysis.

In sum, stylistics is thriving. It may occupy the often forgotten space in between discourse approaches to linguistics and critical approaches to literature; it may be at the periphery of linguistic scholarship rather than at its centre; and it may primarily look at textual objects, such as literature, that in the opinion of some may only barely qualify as examples of 'natural discourse' – but its classical rhetorical pedigree, its aesthetic pragmatism and its pedagogical linguistic worth will assure its place at the centre of any study on human language processing for the foreseeable future.

M. B.

Suggestions for further reading

Gavins, J. and Steen, G. (eds) (2003) *Cognitive Poetics in Practice*, London: Routledge.

Short, M.H. (1996) *Exploring the Language of Poems, Plays and Prose*, London: Longman.

Simpson, P. (2004) *Stylistics*, London: Routledge.

Stockwell, P. (2002) *Cognitive Poetics: an Introduction*, London: Routledge.

Systemic-functional grammar

Introduction

Systemic-functional grammar (SFG) is an approach to language which emerges from British and European language studies, particularly the work of J.R. Firth (1890–1960), as well as Hjelmslev, the Prague School, and Malinowski (Halliday 1985: xxvi; see also Butler 2003). Its key exponent is Michael Alexander Kirkwood Halliday (b. 1925), with early versions of the grammar expounded in papers in Halliday (1956/2005, 1957/2002, 1961/2002, 1966/2002), and consolidated in Halliday 1985/1994 and Halliday and Matthiessen 2004. Early versions of the grammar have been referred to as 'scale and category grammar', and later versions as 'systemic grammar'; finally 'systemic-functional grammar'. It is a grammar which has 'evolved in use; it has no existence apart from the practice of those who use it' (Halliday 1985/2003: 185). SFG is both a theory of language, universal in its relevance to language generally, and a descriptive method particular for each language described (Halliday 2005). Thus to speak of 'systemic-functional grammar' at all is to partially misrepresent the model, as any systemic functional 'grammar' is a blend of both the theory and the description.

Halliday undertook his early studies in China, studying Chinese dialects with Wang Li. His doctoral studies were undertaken in Cambridge, with supervision from the Linguistics Department of the School of Oriential and African Studies in London, under R.H. Robins and J.R. Firth. Firth's then phonologically oriented theory was used by Halliday as a way of describing the grammar of a classical Mandarin text, *The Secret History of the Mongols* (Halliday 2005: xii–xiii). From Firth came 'a post-Saussurian system-structure descriptive model', as well as 'a way of thinking about "the context of situation" … taken over from Malinowski' (Halliday 2005: xiii). Firth viewed meaning as the

'function of a linguistic item in its context of use' (Butler 1985: 3). Context was both structural (a place in the phonological, lexical or grammatical structure), and social, drawing on insights derived from Malinowski's anthropological work, whereby language was seen to be deeply embedded in social and cultural processes, an insight which strongly influenced Halliday's own work and which continues to inform SFG today. Firth saw language as organised along two axes, the **syntagmatic** (horizontal) and the **paradigmatic** (vertical). Along the syntagmatic axis, elements formed **structures**, while on the paradigmatic axis elements were arranged in **systems**, an insight which is 'unique' to Firth (Halliday 2003/1985: 186). Firth differs from Saussure [*see* INTRODUCTION] in that, whereas the latter saw language as one huge system, Firth thought that a large number of systems must be set up to account for the diversity of linguistic phenomena. This distinction is sustained by Halliday, who argues that language is not so much a 'system of signs', 'but a systemic resource for meaning … a **meaning potential**' (Halliday 2003/1985: 192–3). Also characteristic of Firth's work was his insistence that there be a 'renewal of connection', that is, that abstract constructs be relatable back to textual data; and his belief that linguistic descriptions should be applied, at least in the first instance, to so-called **restricted languages**, examples of which would be (Butler 1985: 5) 'the specialist languages of science, sport, narrative, political propaganda, … or even a single text'.

Halliday's seminal 'Introduction to Functional Grammar' (IFG) was first published in 1985, a concretisation of what had hitherto been roneoed teaching notes for students, amounting to about thirty to fifty hours of study (Halliday 1985: xiv). Revised in a second edition in 1994, a third edition appeared in 2004, further revised in conjunction with Christian M.I.M. Matthiessen. This third edition represents the model of SFG most widely applied today, and shares many important theoretical characteristics with the earlier 'scale and category' and 'systemic' grammars, while also incorporating some shifts in both emphasis and description. Most significantly, the later models foreground the notion of system much more strongly. Across them all, however, we see the development of the distinctive characteristics of SFG as a model of language, including the theorisation of strata and units, the use of systems as a key organising principle, the interrelation of theory with contexts of use, and a complex notion of meanings. For a detailed account of the historical shifts in the model, see Butler (1985 and 2003); here we will focus on the key elements of the grammar in its current manifestation.

Theoretical core

SFG is a tri-stratal model where the central stratum is that of **lexico-grammar**, that is, words and structures. Lexico-grammar is realised, or expressed by, **phonology** or **graphology**, and is in turn 'a realisation of patterns at the higher level of **semantics**, interpreted as **discourse semantics**, to highlight the relation between grammatical units and their role in constructing discourse' (Butler 2003: 162).

The concepts of **strata** and **stratification** derive from Lamb (1966) [*see* STRATIFICATIONAL LINGUISTICS], and are distinct from the notion of **rank**. Rank is the hierarchical arrangement of **units**, set up 'to account for the pieces of language which carry grammatical patterns' (Butler 2003: 162–3). It was the observation that the clause 'was the place, or the locus, where fundamental choices in meaning were acted out' (Halliday 2005: xv) which provided the original impetus towards a 'scale and category' grammar.

The ranks at which the grammatical units operate are clause, phrase/group, word and morpheme. Each unit on the rank scale is 'the locus of a number of independent systemic choices' and each consists 'of whole members (one or more than one) of the unit next below' (Halliday 2005: xvi). Further, Halliday and Matthiessen (2004: 9) note that:

> For example, **Come!** is a clause consisting of one group consisting of one word consisting of one morpheme.
>
> Units of every rank may form **complexes**: not only clause complexes but also phrase complexes, group complexes, word complexes and even morpheme complexes may be generated by the same grammatical resource.

> There is the potential for **rank shift**, whereby a unit of one rank may be downranked (downgraded) to function in the structure of a unit of its own rank or of a rank below. Most commonly, though not uniquely, a clause may be downranked to function in the structure of a group.

Compare, for instance: || that | is not | a good idea ||, with || [[teasing a dog]] | is not | a good idea ||,[1] where both the group [that] and the downranked (embedded) clause [[teasing a dog]] play a functional role at clause rank.

A rank-based grammar models constituency in terms of **minimal bracketing**, as opposed to the maximal bracketing of immediate constituent models (Butler 2003: 164), leading to a relatively flat tree structure, and foregrounding the difference between **class** and **function** in the labelling of units. 'A class is a set of items that are in some respect alike' (Halliday and Matthiessen 2004: 50) and 'indicates in a general way its **potential range of grammatical functions**. … But the class label does not show what part the item is playing in any actual structure. … **Functional categories** provide an interpretation of grammatical structure in terms of the overall meaning potential of the language' (Halliday and Matthiessen 2004: 52). Compare for instance, the labelling of classes and functions in Figure 1.

By convention, functional labels are written with an initial upper case letter (Actor, Goal …) and class labels with an initial lower case letter (noun, verb …). Names of systems are written in small capitals (TRANSTIVITY, THEME. …). Importantly, Halliday notes (1994: 34) that 'The significance of any functional label lies in its relationship to the other functions with which it is structurally associated'.

As well as being rank-based, SFG:

> is a 'choice' grammar not a 'chain' grammar (paradigmatic not syntagmatic in its conceptual organisation). Putting these two together means there is a round of choice and operations (a 'system-structure cycle') at each rank, with clause choices realised as clause structures, realised as phrase/group choices, realised as phrase/group structures, and so on …
>
> (Halliday 1985: xix)

Thus, choice and system are central to the theory: 'Systemic theory is a theory of meaning as choice, by which a language, or any other semiotic system, is interpreted as networks of interlocking options: "either this, or that, or the other", "either more like the one or more like the other", and so on' (Halliday 1994: xiv).

A system network 'is a theory of language as choice. It represents a language, or any part of a language, as a resource for making meaning by choosing. Each choice point in the network specifies (1) an environment, consisting of choices already made, and (2) a set of possibilities of which one is (to be) chosen; (1) and (2) taken together constitute a 'system' (Halliday 1985: xxvii). The choices are not 'conscious' in a literal sense, but 'are analytic steps in the grammar's construal of meaning' (Halliday and Matthiessen 2004: 24). Thus in SFG, the emphasis is on system, not structure. Structure 'is an essential part of the description; but it is interpreted as the outward form taken by systemic choices, not as the defining characteristic of language. A language is a resource for making meaning, and meaning resides in systemic patterns of choice' (Halliday and Matthiessen 2004: 23).

In earlier versions of the grammar (for example, 1956, 1957, 1961) the structural axis was

	my friends	have bought	a new house
function	Actor	Process	Goal
class	nominal group	verbal group	nominal group

Figure 1 Labelling of class and function.

much more predominant. The structure of the clause, for example, was described in terms of four elements, **subject** (**S**), **predictor** (**P**), **complement** (**C**), and **adjunct** (**A**). Sinclair (1972) introduced a further two elements – **object direct** (**OD**) and **object indirect** (**O^{I}**). This one structural description, staying close to the syntactic tradition, attempted to account for the multi-functional nature of the clause, and this was 'complex and unsatisfactory' (Halliday 2005: xxii). By 1966, the role of **system** is 'one of the fundamental categories, rather than secondary to class' (Butler 1985: 16), and structure takes it place as being the 'outward form' of systemic choices.

With system as the key organising principle, current SFG models the meaning potential of language as 'a very large network of systems – a **system network**' (Halliday and Matthiessen 2004: 23). Ongoing selections from the network are **realised** by structural operations; structure is thus an output of the system. Systems are related to each other by the principle of **delicacy**; this refers to the dependence of one system on another and constitutes a more 'refined' choice: 'Delicacy in the system ("is a kind of a kind of … ") is the analogue of rank in the structure ("is a part of a part of … ")' (Halliday and Matthiessen 2004: 22).

An illustration of these principles can be seen in Figure 2 (from Halliday and Matthiessen 2004: 23).

In this simplified version of the system network for MOOD:

> A clause is either major or minor in STATUS; if major, it has a Predicator in its structure. A major clause is either indicative or imperative in MOOD; if indicative, it has a Finite (operator) and a Subject. An indicative clause is either declarative or interrogative (still in MOOD); if declarative, the Subject comes before the Finite. An interrogative clause is either yes/no type or WH-type; if yes/no type, the Finite comes before the Subject; if WH-type, it has a WH-element.
>
> (Halliday and Matthiessen 2004: 23–4)

In this network, the system of INDICATIVE TYPE (declarative or interrogative), is a more delicate choice than that of the system of STATUS (major or minor). Ideally, choices in a system are weighted probabilistically, to reflect the likely distribution of choices in the language. For example, for the system of POLARITY, the positive option is weighted 0.9 and the negative option is weighted 0.1 (Halliday and Matthiessen 2004: 22).

The emphasis on systems means that 'grammar is seen as a resource for making meaning – it is a "semanticky" kind of grammar' (Halliday and Matthiessen 2004: 31). That is, priority is given to the view of grammar 'from above', oriented towards meaning as choice in context. Always, however, a 'trinocular' perspective is maintained, attempting to explain grammar also from the perspective of its own level, that is, 'round about', as well as from below (Halliday and Matthiessen 2004: 31).

The term 'system' is also used in another, more generalised sense in SFG, to refer to the overall potential of a language, as opposed to the

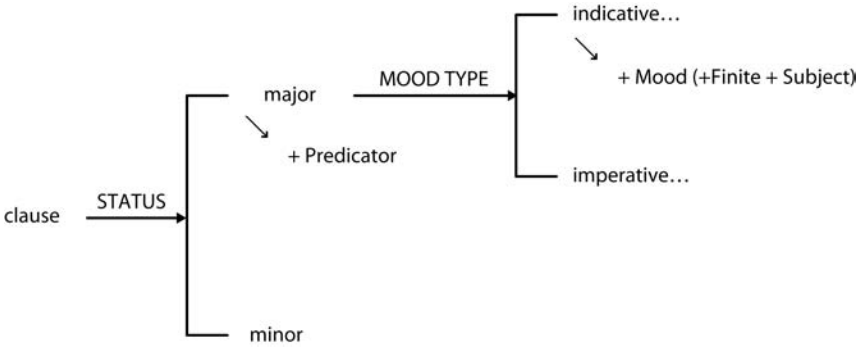

Figure 2 Part of the MOOD system network (adapted from Halliday and Matthiessen 2004: 23).

instantiation of this systemic potential in any particular **text**. Instantiation is understood as a cline: 'system and text define the two poles of the cline – that of the overall potential and that of a particular instance' (Halliday and Matthiessen 2004: 27). The analogy given is that of climate and weather: 'What we call climate and weather are not two different phenomena; rather, they are the same phenomenon seen from different standpoints of the observer' (Halliday and Matthiessen 2004: 27). In between, there are intermediate patterns. Viewed from the instance-end, these can be described as **text types**; viewed from the system end, these can be interpreted as **registers**: 'A register is a functional variety of language [Halliday 1978] – the patterns of instantiation of the overall system associated with a given type of context (a **situation type**)' (Halliday and Matthiessen 2004: 27). The link between grammar and context is present in the theory 'right from the start' (Butler 2003: 154), in terms of both context of culture and context of situation: 'where the "context of culture" is the environment of the language system, the context of situation is the environment of the linguistic instance, the text'. These were categorised in terms of **field**, **mode** and **tenor**, where 'field' was what was going on – the nature of the social action; 'tenor' was who was taking part – the statuses and roles of the interactants; and 'mode' was what the text was doing – the part the discourse was playing in the whole event (Halliday 2005: xxi–xxii).

Relation to meanings and context

The 'functional' component of SFG is seen to be an intrinsic property of language; that is, 'the entire architecture of language is arranged along functional lines. Language is as it is because of the functions in which it has evolved in the human species' (Halliday and Matthiessen 2004: 31). Halliday (1994: xiii) explains that the model is: 'functional in three distinct although closely related senses: in its interpretation (1) of texts, (2) of the system, and (3) of the elements of linguistic structures'.

In relation to texts, the grammar is 'functional in the sense that it is designed to account for how the language is **used**. Every text – that is, everything that is said or written – unfolds in some context of use; furthermore, it is the uses of language that, over tens of thousands of generations, have shaped the system' (Halliday 1994: xiii). This gives rise to an important characterising feature of SFG, namely that it is a 'natural' grammar, rather than an arbitrary one, 'in the sense that everything in it can be explained, ultimately, by reference to how language is used' (Halliday 1994: xiii).

In relation to the system, the model describes the main components of meaning in language as functional components. These components are termed **metafunctions**:

> All languages are organised around two main kinds of meaning, the 'ideational', or reflective, and the 'interpersonal', or active. These components, called 'metafunctions' in the terminology of the present theory, are the manifestations in the linguistic system of the two very general purposes which underlie all uses of language: (i) to understand the environment (ideational), and (ii) to act on the others in it (interpersonal). Combined with these is a third metafunctional component, the 'textual', which breathes relevance into the other two.
>
> (Halliday 1994: xiii)

Importantly, these distinctions of meaning are 'not just made from outside; when the grammar is represented systemically, it shows up as two distinct networks of systems. … What it signifies is that (1) every message is both about something and addressing someone, and (2) these two motifs can be freely combined – by and large, they do not constrain each other … [The textual metafunction also] appears as a clearly delineated motif within the grammar' (Halliday and Matthiessen 2004: 30; and see Caffarel et al. 2004: 28 for a neat encapsulation of simultaneous clausal systems). In SFG, then, meaning is 'immanent', that is, 'meanings are constructed through language, and so part of language itself' (Butler 2003: 155), as opposed to an approach which sees meaning as being outside language.

This understanding of metafunctions is influenced by and related to Malinowski's distinction between pragmatic and magical functions, and Bühler's division into representational, expressive

and conative functions [*see* FUNCTIONALIST LINGUISTICS], but moves away from 'sociological or psychological inquiries' (Halliday 1970: 141) to one that is related to an account of linguistic structure (Halliday 1970: 142). The relation to structure introduces the third sense in which the grammar is functional, that is, in relation to the elements of linguistic structures, because 'each **element** in a language is explained by reference to its function in the total linguistic system. In this third sense, therefore, a functional grammar is one that construes all units of a language – its clauses, phrases and so on – as organic configurations of functions. In other words, each part is interpreted as functional with respect to the whole' (Halliday 1994: xiv).

A functional interpretation of structure is revealed in the description of the clause as 'the central processing unit in the lexicogrammar – in the specific sense that it is in the clause that meanings of different kinds are mapped into an integrated grammatical structure' (Halliday and Matthiessen 2004: 10). All of these elements will be explained in further detail below, but briefly, we see that the clause can be described as a 'splicing together' of independent structures, each reflecting one of the three main metafunctions, that is, the ideational, interpersonal and textual, and each 'is construed by configurations of certain particular functions' (Halliday 1994: 34). Thus, ideational meaning refers to the status of the clause as representation. Here there are two closely related sub-components: experiential meaning, which construes a model of experience, and logical meaning, which constructs logical relations. The former favours segmental (constituent) structures, and the latter favours iterative structures. Interpersonal meaning refers to the status of the clause as exchange, and functions to enact social relationships, favouring prosodic structures. Textual meaning refers to the status of the clause as message, and creates relevance to context, favouring culminative structures.

There exist a number of other linguistic models with 'systemic' and/or 'functional' as a descriptive title, but which may have little relation to SFG. Hudson's 'systemic grammar' (for example, 1971, 1974, 1976) accounts for both syntagmatic and paradigmatic relations, but sees syntax and semantics as separate linguistic levels, and abandons the notion of the multiplicity of systems. Dik's 'functional grammar' (for example, 1978, 1980) aims to develop 'a theory of the grammatical component of communicative competence' (Dik 1980: 47). For detailed discussion and comparison of these and related grammars, see Butler 1985 and 2003. It should also be noted that SFG has theoretical links with 'West-Coast functionalism' and shares some representational features with unification-based approaches to grammar, such as Martin Kay's unification grammar and lexical-functional grammar (Caffarel et al. 2004: 63).

SFG is neither a monolithic nor an invariant model. As it is intended to be used, it is always adapted and extended by the users. Early versions of the model were adapted, for instance, by Fawcett (*passim*), for the purpose of developing a grammar of English for computational applications, and have resulted in a parallel 'dialect' of SFG referred to as the 'Cardiff Grammar' (see Butler 2003 for an extended discussion, and Fawcett 2008). The Cardiff Grammar differs from SFG in a number of respects, primarily in terms of having a strongly cognitive orientation, and also in terms of positing a different number of metafunctions, pushing the model further towards the semantics, and providing more specific descriptions of lexical patterns. A parallel development to that of SFG is that of 'communication linguistics', developed by Michael Gregory (1995) and colleagues in Toronto for the purpose of describing 'communicative acts', influenced both by Halliday and also by American linguistics such as Pike and Gleason (Butler 2003: 190). Another variation of the model can be seen in the 'lexical grammar' of Hunston and Francis (2000), which incorporates insights from both Halliday and Sinclair. We see both continuity and adaptation of SFG in the work of J. R. Martin (1992; Martin and Rose 2003) whose particular focus on discourse leads to a number of differences from the more 'Hallidayan' model. These include a decreased emphasis on grammatical description per se – though not an abandonment of it (see Martin and Rose 2003: 71); and more extensive pursuit of patterns identified as discoursal, such as those termed 'appraisal', accounting for the insertion of speaker evaluation in the discourse. In addition, Martin's model includes significant variation in

the explanation of the relation between context and text. In the Hallidayan model, the difference between text type (closely approximating Martin's sense of 'genre') and register is a matter of perspective, a question of the position taken on the cline of instantiation. For Martin, however, the difference is a stratal one: genre is different in kind from register, and register is seen to be an expression of genre. See Christie and Martin (1997), Hasan (1995, 1999), Hyland (2002), and Martin (1992, 1997, 1999, 2001) for further discussion.

Transitivity

In its ideational function, 'the clause is (also) a mode of reflection, of imposing order on the endless variation and flow of events' (Halliday and Matthiessen 2004: 170). The grammar construes this flow of events as a sequence of **figures**: 'all figures consist of a process unfolding through time and of participants being directly involved in this process in some way; and in addition there may be circumstances of time, space, cause, manner or one of a few other types' (Halliday and Matthiessen 2004: 170). This is achieved in the grammar by the system of TRANSITIVITY. This 'construes the world of experience into a manageable set of **process types**. Each process type provides its own model or schema for construing a particular domain of experience as a figure of a particular kind' (Halliday and Matthiessen 2004: 170). The main clause types are **material**, which construe 'outer experience, the processes of the external world', and **mental**, which construe 'inner experience, the processes of consciousness' (Halliday and Matthiessen 2004: 170). A third type, **relational**, 'relates one fragment of experience to another', through 'identifying and classifying' (Halliday and Matthiessen 2004: 170). These three clause types construe different aspects of the core of the semantic space. There are a number of additional types, located at the boundaries between these.

> On the borderline between 'material' and 'mental' are the **behavioural** processes: those that represent the outer manifestations of inner workings, the acting out of processes of consciousness … and physiological states … On the borderline of 'mental' and 'relational' is the category of **verbal** processes: symbolic relationships constructed in human consciousness and enacted in the form of language, like saying and meaning … And on the borderline between the 'relational' and the 'material' are the processes concerned with existence, the **existential**, by which phenomena of all kinds are simply recognised to 'be' – to exist, or to happen.
>
> (Halliday and Matthiessen 2004: 171)

Importantly, the process types are not strictly delineated typological categories, but regions within a semiotic space. Thus, they may shade into each other at the borders, while the more prototypical examples are clearly differentiated. Such 'systemic indeterminacy' is 'a fundamental principle on which the system is based' (Halliday and Matthiessen 2004: 173). See Halliday and Matthiessen (2004: 172), or the cover of the second edition of *Introduction to Functional Grammar* (Halliday 1994), for visual representations of these relations.

Process types are realised by verbal groups, for example 'built' in *Sir Christopher Wren built this house*. Each process type is accompanied by its own set of **participants**, which 'are *inherent* in the process' (Halliday and Matthiessen 2004: 175), 'bringing about its occurrence or being affected by it in some way … ' (Halliday and Matthiessen 2004: 176) and realised by nominal groups (such as *Sir Christopher Wren*) and embedded clauses (as in '*what the Duke gave my aunt* was that teapot'). Embedded clauses are a form of nominalisation, or *grammatical metaphor*, whereby an atypical or incongruent realisation is enabled between the semantics and the lexico-grammar. Thus, a process-type meaning can be expressed in a nominal form, as in 'the explanation' in *the explanation was clear* (see Halliday and Matthiessen 2004: Chapter 10). **Circumstantial** elements 'are almost always optional augmentations of the clause rather than obligatory components' (Halliday and Matthiessen 2004: 175) and augment the process in some way 'temporally, spatially, causally and so on' (Halliday and Matthiessen 2004: 176), being realised by adverbial groups and prepositional phrases. Circumstances are realised as a system simultaneous with that of

Process types (Halliday and Matthiessen 2004: 173). Together, 'the concepts of process, participant, and circumstance are semantic categories which explain in the most general way how phenomena of our experience of the world are construed as linguistic structures' (Halliday and Matthiessen 2004: 178).

Material clauses represent concrete or abstract doings and happenings, and always have one inherent participant, the Actor. The Actor 'brings about the unfolding of the process' (Halliday and Matthiessen 2004: 180). If the outcome is confined to the Actor then the clause represents a 'happening' and is intransitive. If the outcome is extended to another participant, this is the Goal, and the clause represents a 'doing' and is transitive. In this way the transitivity system reflects traditional accounts of transitivity in terms of a model of 'extension': whether or not actions are extended to other participants (Caffarel et al. 2004: 49). There are further, more delicate options in the system of material processes, and a number of other potential participant roles (see Halliday and Matthiessen 2004: 182–95), for example, **Scope** (named **Range** in Halliday 1985/1994), 'which indicates the domain over which the process takes place' (Halliday and Matthiessen 2004: 192). Compare: [Actor] *they [pro: mat] crossed [Scope] the mountains* with [Actor] *they [pro: mat] crossed [Goal] the wires*.

Mental clauses 'are concerned with our experience of the world of our consciousness' (Halliday and Matthiessen 2004: 197) in terms of emotion, cognition, and perception. There are two inherent participants, the **Senser**, 'the one that "senses", and this is always human-like or 'endowed with consciousness' (Halliday and Matthiessen 2004: 201), and the **Phenomenon**, 'that which is felt, thought, wanted or perceived', and this may take the form of a thing, act or fact (Halliday and Matthiessen 2004: 203). It should be noted that the various clause types are differentiated on both semantic and grammatical grounds. Thus semantically, material and mental (and other) clauses represent different quanta of change 'in the flow of events' (Halliday and Matthiessen 2004: 197). Grammatically, each type has distinctive properties. For example, the unmarked present tense form for material processes is the present-in-present (*I am building a house*), whereas for mental processes it is simple present (*I like my house*). See Halliday and Matthiessen (2004) for a full description of these properties. The identification of these grammatical 'reactances' are an important property of the description, as Halliday asserts that wherever there is a difference in meaning, there will be a difference in wording.

Relational clauses 'serve to characterise and to identify' (Halliday and Matthiessen 2004: 210), establishing a relationship 'of being' between two separate entities, that is, a semiotic, not a material, relation. Thus (in English) 'there are always two inherent participants – two "be-ers"' (Halliday and Matthiessen 2004: 213). These participants carry 'the experiential weight' and 'the process is merely a highly generalised link between those two participants' (Halliday and Matthiessen 2004: 213–14). In English, there are three main types of relation – 'intensive', 'possessive', and 'circumstantial'; and each of these comes in two distinct modes of being – 'attributive' and 'identifying' (see Table 1). The attributive mode ascribes or attributes a class to an entity: it provides 'common class-membership' (Halliday and Matthiessen 2004: 219), and the participants are labelled **Carrier** and **Attribute**. The identifying mode assigns an identity to a thing: it provides a 'unique identity' (Halliday and Matthiessen 2004: 219), and the participants are labelled **Identified** and **Identifier**. Either the identified or the identifier may be mapped onto the roles of **Token** and **Value**

Table 1 The principal categories of 'relational' clause (adapted from Halliday and Matthiessen 2004: 216)

	(i) attributive **'*a* is an attribute of *x*'**	**(ii) identifying** **'*a* is the identity of *x*'**
1) intensive '*x* is *a*'	Sarah is wise	Sarah is the leader; the leader is Sarah
2) possessive '*x* has *a*'	Peter has a piano	the piano is Peter's; Peter's is the piano
3) circumstantial '*x* is at *a*'	the fair is on a Tuesday	tomorrow is the 10th; the 10th is tomorrow

'with Token being the lower "expression" (*or sign* – LJR) and Value the higher "content" (*or meaning* – LJR)' (Halliday and Matthiessen 2004: 230). Both the attributive and identifying relational processes are realised by forms of the verbs 'to be' and 'to have', as well as by related synonyms, such as *became* in *she became suspicious* or *make* in *Manners make the man* (see Eggins 2004 for further examples).

For descriptions of the intermediary process types, **behavioural**, **verbal** and **existential**, see Halliday and Matthiessen (2004): 248–59.

Circumstantial elements, realised by prepositional phrases and (less frequently) adverbial groups, typically occur 'freely in all types of process' (Halliday and Matthiessen 2004: 260). They are indirect, non-obligatory elements of the clause which enhance, extend, elaborate or project other processes, and indeed they are also described as 'minor processes' (Halliday and Matthiessen 2004: 277). The main types (though there are more delicate distinctions) are Extent, Location, Manner, Cause, Contingency, Accompaniment, Role, Matter, Angle, and can be probed by 'wh' questions, for example, 'where?', 'when?'. An example would be *They built the house* ***near the river*** as a circumstance: location.

As previously noted, an important general property of the SFG description is to examine each aspect of the grammar from three perspectives. First, 'from below', in terms of how an element is realised: what is its structure and grammatical properties? Second, 'from around', in terms of other systemic variants which may be possible; and third, 'from above', in terms of asking what kinds of experience (in this instance) they construe. Equally importantly, language in the SFG model is not described as a reflection of an external, 'objective' reality, but as a construal of it: in the case of ideational meanings, it is the choice of process and participants and circumstances which construes a particular version of an event; that is, through the grammar, a picture is created of 'what is going on'. Contrast for example the two clauses: (a) *Europeans invaded Australia* and (b) *Europeans arrived in Australia.* Both processes are material with 'Europeans' as Actor, but in (a) the process is transitive and is extended to a second participant (the Goal). In (b), the process is intransitive, and 'Australia' now appears within a circumstance, implying an almost indirect impact on the country, and that the event was without immediate consequence. This implies differing degrees of responsibility on the part of the 'same' Actor in each case. There is neither a necessary nor correct way to represent this historical event, but each representation brings with it its own construal of meaning (see also ergativity below). Similarly, the selection of a different process type will construe a quite different figure. For example, in *She is happy*, the relational process 'to be' ascribes the Attribute of happiness to 'she' as the Carrier. In *she laughed*, 'she' is the Behaver, participating in the behavioural process, 'to laugh'. The first clause construes a state of being; the second construes a more concrete activity. Each could be said to represent a similar state of positive affect, and yet, this has been construed as quite different events in the grammar.

Ergativity

Complementary to the transitive model of the grammar is the ergative model, an additional property of the system of transitivity, which foregrounds the role of Agency in providing a 'generalised representational structure common to every English clause' (Halliday and Matthiessen 2004: 281). This system is simultaneous with those of process type and circumstance (Halliday and Matthiessen 2004: 173). Here the key variable is not a model of extension, as in transitivity, but of causation: 'The question at issue is: is the process brought about from within, or from outside?' (Halliday and Matthiessen 2004: 287). Every process must have one participant central to the actualisation of the process; 'without which there would be no process at all' (Halliday and Matthiessen 2004: 288). This is the **Medium** and along with the process forms the *nucleus* of the clause. The Medium is obligatory and is the only necessary participant, if the process is represented as being self-engendering. If the process is engendered from outside, then there is an additional participant, the **Agent**. Options in the ergative model of transitivity define the voice, or agency, of the clause. A clause with no feature of 'agency' is neither active nor passive but **middle** (for example, *Europeans arrived*). One with agency is non-middle, or **effective**, in agency (for example, *Europeans invaded Australia*). An effective

clause is then either operative or receptive in voice. In an operative clause, the Subject is the Agent and the process is realised by an active verbal group; in a receptive clause the Subject is the Medium and the process is realised by a passive verbal group (*Australia was invaded by Europeans*) (Halliday and Matthiessen 2004: 297).

The combination of the transitive and ergative perspectives enables a description of the clause which accounts for ideational meanings, that is, providing a picture of what is going on. These meanings link to the construction of field in the context; Halliday and Matthiessen (2004: 174) note that 'Part of the "flavour" of a particular text, and also of the register that it belongs to, lies in its mixture of process types' and that these choices typically change 'in the course of the unfolding of the text'. Thus, different fields will be characterised by quite different construals of figures, involving distinct selections of process type, associated participants and circumstances. The fields will each be 'about' something different. At the same time, texts which may be different in field, but alike in genre (for example, a procedure about building refrigerators vs. a procedure for how to make a cake) will be characterised by similar sets of process types, or by particular process types in particular generic stages. For example, procedures will typically have a predominance of material processes, especially in the stage which outlines the steps to be followed, for instance, whereas as a scientific report will typically have a predominance of relational processes, used to classify and describe, especially in initial stages of the report. Martin (1992) and Martin and Rose (2003) provide important extensions of the grammatical modelling of ideational meanings at the higher stratum of discourse semantics.

Theme

In its textual function, the clause has the character of a 'message' (Halliday and Matthiessen 2004: 64). This is construed in the clause via the systems of THEME and INFORMATION. In the system of THEME, the element which 'serves as the point of departure of the message' and which 'locates and orients the clause within its context' is known as the Theme. 'The remainder of the message, the part in which the Theme is developed' is the **Rheme**. In English, Theme is indicated by first position in the clause, although this may vary across languages. For example, in Tagalog, (topical) themes are indicated segmentally, by *ang*, and tend to appear at the end of the clause (Martin 2004). Themes may be simple or multiple. **Simple Themes** consist of one element only. This is the first element in the clause which also has an experiential function, i.e. a participant, process or circumstance (even if one of these elements may be structurally complex, e.g., a nominal group complex) and this element is called the **topical Theme** (Halliday and Matthiessen 2004: 79). Multiple themes contain 'other elements in the clause preceding the topical Theme' and these may be either **textual Themes** (such as continuatives or conjunctions) or **interpersonal Themes** (such as vocatives or modal and comment adjuncts). There may be multiple textual and/or interpersonal Themes, but only one topical Theme. In the typical or unmarked case for declarative clauses, topical Theme is conflated with Subject in the mood structure of the clause. In the marked case, topical Theme is conflated with an element other than subject, thereby creating some additional meaning, such as a sense of contrast. Each mood type has its own marked and unmarked conflations of elements (Halliday and Matthiessen 2004: 72ff.). See Table 2 below for examples of themes.

Themes are most commonly realised by nominal groups (simple or complex), adverbial groups and prepositional phrases. Through nominalisation, they may also be realised by embedded clauses, contributing to the structure of **thematic equatives**, whereby 'all the elements of the clause are organised into two constituents … linked by a relationship of identity', as in 'what the duke gave to my aunt was that teapot' (Halliday and Matthiessen 2004: 69). The unfolding of Themes across a text, from clause to clause, contributes to the 'texture' of the text. See Eggins (2004) for a description of different possible 'methods of development', or ways in which transitions are made between Themes and Rhemes across clauses.

Complementary to the system of THEME is the system of INFORMATION, accounting for the 'tension between what is already known or predictable and what is new or unpredictable'

Table 2 Theme examples

Theme			*Rheme*	
textual	interpersonal	topical (marked)	topical (unmarked)	
			she	is happy with the outcome
		with the outcome		she is happy
and	luckily		she	is happy with the outcome
and so	luckily, John		she	is happy with the outcome

(Halliday and Matthiessen 2004: 89). The information unit is a unit parallel to, but separate from, the clause, realised intonationally. Two functions, the **Given** and the **New**, make up the structure of the information unit. In the unmarked form, the Given correlates with the topical Theme, and the new with (an aspect of) the Rheme. Theme is speaker-oriented, construing what the speaker takes as point of departure. Information is listener-oriented, construing what is already known or accessible to the listener. But both are speaker-assigned, mapping both structures 'one on to the other to give a composite texture to the discourse and thereby relate it to its environment', potentially resulting in 'an astonishing variety of rhetorical effects' (Halliday and Matthiessen 2004: 93). Such effects are particularly enhanced by the system of THEME PREDICATION, as in 'it wasn't **the job** that was getting me down' which allows the conflation of theme with new as 'a regular feature' (Halliday and Matthiessen 2004: 96).

A description of the clause in terms of theme and information provides an account of textual meanings, explaining how the clause is positioned in relation to the unfolding text (Halliday and Matthiessen 2004: 66). These meanings link to the enactment of mode in the context:

> Thematic choices realise meanings about the organisation of the communicative event (how the text hangs together), and the experiential and interpersonal distance involved (how the text relates to its context). The theme system contributes to the realisation of such meanings by offering us choices about what meanings to prioritise in a text, what to package as familiar and what as new, what to make contrastive, etc.
> (Eggins 2004: 320)

For example, texts which are positioned towards the active, 'spoken' end of the mode continuum will typically prioritise human Actors as topical Themes, with more interpersonal Themes and more textual Themes, few marked Themes, and an unplanned method of development, all reflecting the dynamic nature of spoken texts. Those which are towards the written end of the mode continuum will be more likely to prioritise nominalisations as topical Themes, with fewer interpersonal and textual Themes, more marked Themes, and a carefully structured method of development, reflecting the more static nature of such texts (cf. Eggins 2004: 326).

At the same time, theme can be seen to provide an 'angle on the Field', revealing its 'underlying concerns' (Halliday and Matthiessen 2004: 105). For example, an historical description which consistently thematises marked topical Themes of time will construct a time-orientation for that text.

Importantly, the clause-based descriptions of thematic structure have been extended 'upwards' to account for organisational patterns at the stratum of discourse semantics. Martin (1992) describes patterns of theme and information at the level of the paragraph (hyper-Theme and hyper-New) and the level of the text (macro-Theme and macro-New). These work together to construct a 'hierarchy of periodicity' which scaffolds discourse units (Martin and Rose 2003: 186).

Mood

In its interpersonal function, the clause has the meaning of an **exchange**. Interpersonal meanings are construed in the clause via the systems of MOOD and MODALITY, giving the clause its character as an 'interactive event involving speaker and audience' (Halliday and Matthiessen

2004: 106). The speaker adopts speech roles and assigns roles to the listener. The most fundamental of these roles are defined by the variables of (i) giving and (ii) demanding, cross-cut with (iii) goods and services and (iv) information; see Table 3, producing the primary speech functions of **offer**, **command**, **statement** and **question** (Halliday and Matthiessen 2004: 108).

The exchange of information gives rise to **propositions**; the exchange of goods and services to **proposals**. The distinctive grammar of these is expressed by the **mood** element of the clause, consisting of (i) the **Subject** (a nominal group or embedded clause) and (ii) the **Finite** (primary tense or modal operator in the verbal group). The subject is recognised as 'that element which is picked up by the pronoun in the tag' (Halliday and Matthiessen 2004: 112) and functions to supply the element by which a proposition can be affirmed or denied (Halliday and Matthiessen 2004: 117). The finite circumscribes the proposition or makes it 'arguable' (Halliday and Matthiessen 2004: 115) by reference to the time of speaking or speaker judgement. Together the subject and finite 'carry the burden of the clause as an interactive event' (Halliday and Matthiessen 2004: 120) and with their presence and relative order, realise the Mood of the clause, as follows: (i) the order Subject before Finite realises 'declarative'; (ii) the order Finite before Subject realises 'yes/no' interrogative; (iii) in a *wh-* interrogative, the order is (i) subject before Finite if the *wh-* element is the subject; (ii) finite before Subject otherwise (Halliday and Matthiessen 2004: 115). Mood may also be realised prosodically-phonologically by TONE, for example, a declarative is typically realised by a falling tone (Caffarel et al. 2004: 44).

The remainder of the clause constitutes the **Residue**, consisting of one **Predicator**, that is, the verbal group without the Finite, including non-primary tense, aspect, phase, voice and process; potentially one or two **Complements**, an element which has the potential of being Subject but which is not; and an (in principle) indefinite number of circumstantial **Adjuncts**, elements which do not have the potential to be made Subject, typically realised by an adverbial group or by a prepositional phrase. In addition, there may be **mood Adjuncts** and **comment Adjuncts**, which fall outside the Residue (Halliday and Matthiessen 2004: 121–32). Further descriptions are provided of *wh-* interrogatives, exclamatives and imperatives (Halliday and Matthiessen 2004: 134ff.), as well as of minor clauses, which do not select for MOOD (Halliday and Matthiessen 2004: 153), and of ellipsis, where an element, such as subject, is left implicit (Halliday and Matthiessen 2004: 151).

Interpersonal meaning is also constructed in the clause via the system of MODALITY. Modality refers to 'the speaker's judgement on the status of what is being said' (Halliday and Matthiessen 2004: 143), construing the 'region of uncertainty that lies between "yes" and "no"' (Halliday and Matthiessen 2004: 147). In relation to the grammar of propositions, modality is referred to as **modalisation**, and the meanings hinge on degrees of probability and usuality, expressed by finite modal operators, modal Adjuncts, or both, for example, *that's* ***probably*** *John.* In relation to the grammar of proposals, modality is referred to as **modulation**, and meanings hinge on degrees of obligation and inclination, expressed by finite modal operators or expansions of the Predicator, as in *you* ***should*** *know that.*

Table 3 Giving or demanding, good-&-services or information (adapted from Halliday and Matthiessen 2004: 107)

role in exchange	**Commodity exchanged**	
	(a) goods-&-services	**(b) information**
(i) giving	'offer' would you like this teapot?	'statement' he's giving her the teapot
(ii) demanding	'command' give me that teapot!	'question' what is he giving her?

In addition to the MODALITY TYPE, simultaneous sub-systems of modality include POLARITY, the opposition between positive and negative; VALUE: whether the modality is high, median or low in value; and ORIENTATION: whether the modality is subjective or objective, explicit or implicit in its orientation (Halliday and Matthiessen 2004: 150). Interestingly, in relation to VALUE, Halliday and Matthiessen note (Halliday and Matthiessen 2004: 147) 'even a high value modal is less determinate than a polar form … you only say you are certain when you are not'.

The analysis of MOOD and MODALITY provides a description of the clause which accounts for interpersonal meanings: how speakers/writers use language to interact, and how they construe their personal perspectives on the communication. Interpersonal meanings link to the construction of tenor in the context, enabling roles and relationships to be enacted. For example, a highly formal tenor is likely to be characterised by fundamental differences in the grammatical moods used by the respective speakers, whereas an informal tenor will be characterised by reciprocity of mood choices (Eggins 2004; Poynton 1985). There is an important correlation between the grammatical mood of the clause and the speech function (the semantic categories) of the clause (Eggins 2004). Typically the congruent relation would be that a statement is realised by a declarative; a question by an interrogative, and so on. However, there are often incongruent realisations of the speech function, for instance, when a command is realised by something other than an imperative mood (compare: 'Stop talking' with 'It's very noisy in here') construing nuances in the tenor.

Again significant extensions have been made to the description of interpersonal meanings in terms of extending the grammar 'upwards' to the level of discourse. **Appraisal theory** (Martin and Rose 2003) accounts for the ways in which speakers insert their evaluations in texts: 'the kinds of attitudes that are negotiated in a text, the strength of the feelings involved and the ways in which values are sourced and readers are aligned' (Martin and Rose 2003: 22; see also Martin and White 2005).

Across each of the metafunctions, the core grammatical descriptions of the clause can be extended: above the clause in terms of rank, to the clause complex; above the clause in terms of strata, to the stratum of discourse, as already discussed; below to the rank of group and phrase, where there are more extensive descriptions of, for instance, the nominal and verbal groups (see Halliday and Matthiessen 2004); and beyond, to other semiotic resources (as described below). The grammatical description and the theory behind it provides a powerful base for analysing language in relation to a number of different but complementary meanings, and for analysing language in relation to its social context.

SFG and applications

As well as extensive descriptions of the English language, SFG has also been used to describe a diverse range of other languages, for instance, Tagalog, French and Japanese (see Caffarel et al. 2004 for a comprehensive overview). As the majority of descriptive work has been applied to English, SFG has sometimes been described as being 'anglo-centric', however this represents a fundamental misunderstanding of the model: 'the general theory was never based on English and was thus never anglo-centric' (Caffarel et al. 2004: 7). The theory itself does not differentiate between varieties of language; 'that is the task of systemic *descriptions*' (Caffarel et al. 2004: 10).

Simultaneously with the development of the grammar, and as a result of the Firthian inheritance of 'renewal of connection', Halliday's theoretical framework was also made relevant to studies of text and discourse, and there has been significant work on cohesion, developed by Halliday and Hasan (1976). This tradition has been significantly extended to studies of genre and discourse by Martin (*passim*).

Other applications motivating the theorisation and use of the grammar have been register studies (e.g., Halliday and Martin 1993); stylistic studies (Halliday 1973); language development (Halliday 1975; Painter *passim;* Williams and Lukin 2004); casual conversation (Eggins and Slade 1997); text generation (Matthiessen and Bateman 1991); language typology (Caffarel et al. 2004; Rose 2001); literacy practices across a range of levels, languages and language positions, for example, early literacy in a first language, second language practices, academic literacy

practices, and professional literacy (for example, Christie 1999; Ravelli and Ellis 2004; Unsworth 1993, 2000, 2008). See Halliday 1994: xxix–xxx for a suggestive list of some of the possible applications of linguistics.

Intersections of the model with a number of related disciplines have also been pursued, for instance in the direction of sociology, taking up the work of Basil Bernstein (Cloran et al. 1996), cognitive science (Halliday and Matthiessen 1999; Fawcett, *passim*), and critical discourse analysis (Wodak and Martin 2003). More recently, insights from SFG have been taken up and applied to the description of semiotic systems other than language, such as two-dimensional images, three-dimensional spaces, sound, hypertexts, and so on, leading to a social-semiotic approach to multi-modal discourse analysis, as illustrated in the work of Kress and van Leeuwen (2006) and O'Toole (1994).

Good teaching models of the grammar can be found in a range of publications, as separately listed below. A comprehensive collection of Halliday's papers can be found in the *Collected Works of M.A.K. Halliday*, *Vols. 1–10*, edited by Jonathan J. Webster (London: Continuum); see also Hasan (in Webster 2005). There are a wide variety of edited volumes of thematically organised research papers in addition to those already mentioned; (see, for example, Christie 1999; Christie and Martin 1997; Davies and Ravelli 1992; Ghadessy 1995; Halliday and Martin 1993; Martin and Veel 1998).

The diverse developments and applications of the model demonstrate the robust and productive nature of the approach, and its ability to illuminate a wide range of aspects of communication as a social semiotic, be it in terms of clause-level grammar of written texts, or the contemporary practices of multi-modal communication.

L. J. R.

Notes

1 || clause boundary; | group boundary; [[ ]] downranked clause; see also Halliday and Matthiessen (2004: 10).

Suggestions for further reading

Butt, D., Fahey, R., Spinks, S. and Yallop, C. (2000) *Using Functional Grammar: An Explorer's Guide*, 2nd edn, Sydney: NCELTR Macquarie University.

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Eggins, S. (2004) *An Introduction to Systemic Functional Linguistics*, 2nd edn, London: Continuum.

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Ravelli, L.J. (2000) 'Getting Started with Functional Analysis of Texts', in L. Unsworth (ed.), *Researching Language in Schools and Communities: Functional Linguistic Perspectives*, London: Cassell, pp. 27–59.

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T

Text linguistics

Background

As Hoey points out (1983–4: 1),

> there is a tendency … to make a hard-and-fast distinction between discourse (spoken) and text (written). This is reflected even in two of the names of the discipline(s) we study, discourse analysis and text linguistics. But, though the distinction is a necessary one to maintain for some purposes … it may at times obscure similarities in the organisation of the spoken and written word.

The distinction Hoey mentions is made in this volume on practical, not theoretical grounds, and the overlap between text linguistics and discourse and conversation analysis should be borne in mind.

Early modern linguistics, with its emphasis on discovering and describing the minimal units of each of the linguistic levels of sound, form, syntax and semantics, made no provision for the study of long stretches of text as such; traditional grammatical analysis stops at sentence length. It is even possible to argue that 'the extraction of tiny components diverts consideration away from the important unities which bind a text together' (de Beaugrande and Dressler 1981: 21) and, although Zellig Harris (1952) had proposed to analyse whole discourses on distributional principles, employing the notion of transformations between stretches of text, this emergent interest in text and discourse study was lost at the time in Chomsky's modification of the notion of transformation to an intrasentential phenomenon.

Early large-scale enquiries into text organisation remained essentially descriptive and structurally based (Pike 1967; Koch 1971; Heger 1976), with occasional expansion of the framework to include text sequences or situations of occurrence (Coseriu 1955–6; Pike 1967; Harweg 1968; Koch 1971). **Text** was defined as a unit larger than the sentence, and the research was orientated towards discovering and classifying types of text structure; these were assumed to be something given, rather than something partly construed by the reader, and dependent on context. 'We end up having classifications with various numbers of categories and degrees of elaboration, but no clear picture of how texts are utilised in social activity' (de Beaugrande and Dressler 1981: 23).

The descriptive method, however, tends to break down because the language is too complex, with too many and diverse constituents to be captured. Ironically, it was the concept of transformations, lost by Harris to Chomsky, which allowed a new outlook on text that encouraged the upsurge in text linguistics during the 1970s. In transformational grammar, the infinite set of possible sentences of a language are seen as derivable from a small set of underlying deep patterns plus a set of rules for transforming these into the more elaborate actual surface structures. It was argued, first (Katz and Fodor 1963), that a whole text could be treated as a single sentence by seeing full stops as substitutes for conjunctions like *and*. This approach, however, deliberately leaves out reference to speakers' motives and knowledge. In addition, it

ignores the fact that 'factors of accent, intonation, and word-order within a sentence depend on the organisation of other sentences in the vicinity' (de Beaugrande and Dressler 1981: 24). This was noted by Heidolph (1966), who suggests 'that a feature of "mentioned" vs. "not mentioned" could be inserted in the grammar to regulate these factors'. Isenberg (1968, 1971) lists other factors which could be dealt with within a single sentence, such as pronouns, articles and tense sequences, and 'appeals to coherence relations like cause, purpose, specification, and temporal proximity' (de Beaugrande and Dressler 1981: 24).

Similar approaches to text analysis may be found in the school of rhetorical structure analysis, where the emphasis is on how units of meaning (which are not necessarily sentences) relate to one another in a hierarchy, and how such devices as exemplification, summary, expansion, etc. build on core propositions to construct the finished text (Mann and Thompson 1988), an approach which in its turn owes much to the text linguistics of Longacre (1983).

The **Konstanz project**, set up at the University of Konstanz in Germany, is related to these traditions of analysis. A group of researchers, including Hannes Rieser, Peter Hartmann, János Petöfl, Teun van Dijk, Jens Ihwe, Wolfram Köck and others, attempted to construct a grammar and lexicon which would generate a Brecht text; some of the results of this project are presented by van Dijk et al. (1972). The project highlighted more problems than it solved, though (de Beaugrande and Dressler 1981: 24): 'Despite a huge apparatus of rules, there emerged no criteria for judging the text "grammatical" or "well-formed" … The problem of common reference was not solved'. The basic assumption of the undertaking was questioned by Kummer (1972), who points out that 'the "generating" of the text is presupposed by the investigators rather than performed by the grammar' (de Beaugrande and Dressler 1981: 25).

In contrast to the grammatical method employed by the Konstanz group, Petöfl's (1971, 1974, 1978, 1980) **text-structure/world-structure theory** (**TeSWeST**) operates with factors relating to text users rather than to the text as an isolated artefact, and with representational devices drawn from formal logic. His project is extremely complex (de Beaugrande and Dressler 1981: 25–6):

> In the 1980 version, components are offered for representing a text from nearly every perspective. To meet the demands of the logical basis, a 'canonic' mode (a regularised, idealised correlate) is set up alongside the 'natural language' mode in which the text is in fact expressed. Rules and algorithms are provided for such operations as 'formation', 'composition', 'construction', 'description', 'interpretation', and 'translation'. The reference of the text to objects or situations in the world is handled by a 'world-semantics' component; at least some correspondence is postulated between text-structure and world structure.

Retaining the idea of a text grammar designed to cope with features of text which a sentence grammar cannot handle, van Dijk (1972) introduces the notion of the **macrostructure**, a large-scale statement of the text's context (de Beaugrande and Dressler 1981: 27; see van Dijk 1977: chapter 5):

> Van Dijk reasoned that the generating of a text must begin with a main idea which gradually evolves into the detailed meanings that enter individual sentence-length stretches. … When a text is presented, there must be operations which work in the other direction to extract the main idea back out again, such as *deletion* (direct removal of material), *generalisation* (recasting material in a more general way), and *construction* (creating new material to subsume the presentation). … Accordingly, van Dijk turned to cognitive psychology for a *process-oriented* model of the text. In collaboration with Walter Kintsch, he investigated the operations people use to summarise texts … (cf. Kintsch and van Dijk 1978; van Dijk and Kintsch 1978). The typical summary for a text ought to be based on its macrostructure. … However, research showed that the actual outcome involves both the macro-structure of the text and previously stored macro-structures

based on knowledge of the events and situations in the real world.

De Beaugrande and Dressler (1981) view their own **procedural** approach to text linguistics as evolved out of these other views, and most text linguists make some reference to both micro- and macrostructural features of the text, and to speakers' world knowledge. By a procedural approach, de Beaugrande and Dressler (1981: 31) mean an approach in which 'all the levels of language are to be described in terms of their utilisation'. Beaugrande and Dressler (1931: 3) define text as a communicative occurrence which meets seven standards of **textuality** – namely **cohesion** and **coherence**, which are both text-centred, and **intentionality**, **acceptability**, **informativity**, **situationality** and **intertextuality**, which are all user-centred. These seven standards, described below, function as the constitutive principles which define and create communication. In addition, at least three regulative principles, also described below, control textual communication (for the distinction between constitutive and regulatory rules and principles, *see* SPEECH-ACT THEORY). These are **efficiency**, **effectiveness** and **appropriateness**.

The constitutive principles of communication

Cohesion

The major work on cohesion in English is Halliday and Hasan (1976/1989), but Jakobson's (1960) stress on textual parallelism created by patterning and repetition in text [*see* STYLISTICS] is the earliest detailed development of the idea of cohesion (see Closs Traugott and Pratt 1980: 21).

Cohesion concerns the way in which the linguistic items of which a text is composed are meaningfully connected to each other in a sequence on the basis of the grammatical rules of the language. In English, cohesion is created in four ways (Halliday 1994: Chapter 9): by reference, ellipsis (including substitution), conjunction and lexical organisation.

Reference may be of several types: **exophoric**, referring out of the text to an item in the world (*look at* ***that***); **endophoric**, referring to textual items either by **cataphora**, forward reference (as in *the house that Jack built*, where *the* refers forward to the specifying *that Jack built*); or **anaphora**, backward reference (as in *Jack built a house. It* … , where *it* refers back to *house*); **homophora**, self-specifying reference to an item of which there can only be one, or only one that makes sense in the context (***the sun*** *was shining* or *She fed* ***the cat***). Devices that refer are the personal pronouns and demonstratives, which corefer, and comparatives, which contrast.

Ellipsis works anaphorically by leaving out something mentioned earlier, as in *Help yourself* (for instance, to some apples mentioned earlier). **Substitution** works by substituting a 'holding device' in the place of a lexical item *Help yourself to* ***one***.

Devices which create **conjunction** constitute cohesive bonds between sections of text. There are three types, according to Halliday (1995: Chapter 9):

1. **Elaboration** by **apposition**, either **expository** (*in other words*) or **exemplifying** (*for example*); or by **clarification**: **corrective** (*or rather*), **distractive** (*incidentally*), **dismissive** (*in any case*), **particularising** (*in particular*), **resumptive** (*as I was saying*), **summative** (*in short*) and **verifactive** (*actually*).
2. **Extension**, which is either **additive** (*and*, *nor*), **adversative** (*but*), or a **variation** type, of which there are three – **replacive** (*instead*, *on the contrary*), **subtractive** (*apart/except from/for that*) and **alternative** (*alternatively*).
3. **Enhancement**, either **spatio-temporal** (*here*, *there*, *nearby*, *behind*, *in the first place*) or **manner** (comparison, reference to means), or **causal-conditional** (*so*, *therefore*) or **matter** (*in this respect*, *in other respects*).

De Beaugrande and Dressler (1981: 71–3) call these relationships **junctions**, and the devices signalling them **junctive expressions**; they distinguish four major types:

1. **Conjunction**, which is an additive relation linking things which have the same status, e.g., both true in the textual world (see below, under **coherence**). Their signals are *and*, *moreover*, *also*, *in addition*, *besides*, *furthermore.*
2. **Disjunction**, which links things that have alternative status, e.g., two things which

cannot both be true in the textual world. Their signals are *or*, *either/or*, *whether or not*.

3. **Contrajunction**, which links things having the same status but appearing incongruous or incompatible in the textual world, i.e. a cause and an unanticipated effect. Their signals are *but*, *however*, *yet*, *nevertheless*.
4. **Subordination**, which links things when the status of one depends on that of the other, e.g., things true under certain conditions or for certain motives (precondition/event, cause/effect, etc.). Their signals are *because*, *since*, *as*, *thus*, *while*, *therefore*, *on the grounds that*, *then*, *next*, *before*, *after*, *since*, *whenever*, *while*, *during*, *if*.

Lexical cohesion is created by **repetition**, **synonymy** and **collocation**. While reference, ellipsis and conjunction tend to link clauses which are near each other in the text, lexical cohesion tends to link much larger parts of the text (but see the discussion of patterns under 'Coherence' below).

One of the most thoughtful and prolific writers on the subject of relations between clauses is Eugene Winter (Hoey 1983: 17):

> His work on clause relations can for the most part be divided into two major strands. On the one hand, he is concerned to place a sentence in the context of its adjoining sentences and show how its grammar and meaning can only be fully explained if its larger context is taken into account … On the other, he is concerned to reveal the clause organisation of a passage as a whole without focusing on any one sentence in particular within it.

In a similar vein, de Beaugrande and Dressler (1981: 79) distinguish between **short-range** and **long-range** stretches of surface text structures, the former set up as closely knit patterns of grammatical dependencies, the latter constituted by the reutilisation of previous elements or patterns (see also van Dijk 1977: 93).

However, as Hoey (1983: 18) points out, Winter's (1971) definition of the clause relation as 'the cognitive process whereby we interpret the meaning of a sentence or group of sentences in the text in the light of its adjoining sentence or group of sentences', has the implication that 'uninterpreted grammatical cohesion is not a relation'. Most writers on cohesion (see, for instance, Halliday and Hasan 1989) stress that it is created by the reader on the basis of the signalling devices, and Halliday and Hasan (1989) develop their earlier work on the overt signals of cohesion by stressing that cohesion is a necessary but not sufficient condition for coherence. For this reason, their work is discussed under 'Coherence' below.

De Beaugrande and Dressler (1981: 80) include as long-range cohesive devices (compare Halliday's lexical-cohesion devices listed above):

Recurrence: the exact repetition of material

Partial recurrence: different uses of the same basic language items (word stems).
Parallelism: reuse of structures with different material in them.
Paraphrase: approximate conceptual equivalence among outwardly different material.
Proforms: brief, empty elements used to keep the content of fuller elements current and to reuse basic syntactic structures.
Ellipsis: allows the omission of some structural component, provided a complete version is recoverable from elsewhere in the text.

Coherence

Coherence concerns the way in which the things that the text is about, called the **textual world**, are mutually accessible and relevant. The textual world is considered to consist of concepts and relations. A **concept** is defined as 'a configuration of knowledge (cognitive content) which can be recovered or activated with more or less unity and consistency in the mind', and **relations** as the links between the concepts 'which appear together in a textual world' (de Beaugrande and Dressler 1981: 4). Some of the most common relations can be classified in terms of two major notions, namely causality relations and time relations.

1. Causality relations 'concern the ways in which one situation or event affects the conditions for some other one' (de Beaugrande and Dressler 1987: 4), and are of four major types:

i. **Cause**: *David hit the ball so hard that it flew over the hedge;* here the event of 'hitting the ball hard' has created the **necessary conditions** for the event of 'the ball flying over the hedge'.
ii. **Enablement**: *Tabitha lay quietly in the sun and Tomas crept over and pulled her tail;* here a weaker relation obtains between the event consisting of Tabitha lying quietly in the sun, and the event consisting of Tomas creeping over and pulling her tail; the former event is a **sufficient**, but not a **necessary**, condition for the latter.
iii. **Reason**: *Because I've been writing about text linguistics all day I deserve a rest this evening;* in this case, the second event follows as a rational response to the first, but is not actually caused or enabled by it.
iv. **Purpose**: *You are reading this to find out about text linguistics;* in this case, although the first event enables the second, there is an added dimension, in so far as the second event is the **planned outcome** of the first.

2. **Time** relations concern the arrangement of events in time. In the case of cause, enablement and reason, an earlier event causes, enables or provides the reason for a later one, so that we might say that **forward directionality** is involved. Purpose, however, has **backward directionality**, since a later event is the purpose for an earlier event.

Winter, for his part, divides clause relations into the two broad classes of **logical sequence** relations and **matching** relations, where the most basic form of logical sequence relation is the time sequence (see Hoey 1983: 19). Both of these types are, however, governed by 'a still more fundamental relation, that of situation–evaluation, representing the two facets of world-perception "knowing" and "thinking". Indeed … all relations are reducible to these basic elements' (Hoey 1983: 20). De Beaugrande and Dressler (1981) do not display such an overtly reductive tendency.

- **Logical Sequence relations** 'are relations between successive events or ideas, whether actual or potential' (Hoey 1983: 19). They include:
  - **Condition–consequence**, signalled by, e.g., *if* (*then*);
  - **Instrument–achievement**, signalled by, e.g., *by* (*means of*);
  - **Cause–consequence**, signalled by, e.g., *because*, *so*.
- **Matching relations** 'are relations where statements are "matched" against each other in terms of identicality of description' (Hoey 1983: 20). They include:
  - **Contrast**, signalled by, e.g., *however;*
  - **Compatibility**, signalled by, e.g., (*and*), (*similarly*).

One of the most valuable aspects of Winter's work – and one which powerfully suggests that his (and Hoey's) work should be seen as a contribution to our understanding of coherence rather than only of cohesion – is his insistence that a clause relation cannot simply be read off from one textual surface signal. This must, of course, be obvious to anyone who peruses the various lists writers produce of signalling devices, since the same item is often listed as a signal for several relations (see, for instance, Halliday and Hasan 1989: 242–3). What Winter importantly stresses, however, is that *other* lexical items, in addition to junctive expressions, help readers to determine which relation a given junctive expression signals. He divides junctive expressions proper into two traditional types, namely **subordinators**, which he calls **Vocabulary 1**, and **conjuncts**, which he calls **Vocabulary 2**. But he adds to these the class of **lexical signals**, which he calls **Vocabulary 3**. The *same* clause relation may be signalled by an item from any one of these three classes, as Hoey (1983: 23), drawing on Winter (1977), demonstrates. The **instrument–achievement** relation is signalled in each of the following three near-paraphrases (signals in italics):

1. *By* appealing to scientists and technologists to support his party, Mr Wilson won many middle-class votes.
2. Mr Wilson appealed to scientists and technologists to support his party. He *thereby* won many middle-class votes.

3. Mr Wilson's appeals to scientists and technologists to support his party *were instrumental* in winning many middle-class votes.

In (1) the relation is signalled with a Vocabulary 1 item; in (2) by a Vocabulary 2 item; and in (3) by a Vocabulary 3 item. Furthermore (Hoey 1983: 24), Vocabulary 3 items not only help signal the relations that hold between the sentences of a paragraph. They also signal the organisation of longer passages and whole discourses. Winter (1977) (and see also Winter 1986) draws attention, for example, to what he terms 'items of the metastructure'; these are lexical signals which serve a larger function.

Hoey's own work is mostly concerned with this metastructural organisation of the text. He discusses **matching patterns**, **general–particular patterns** and, in particular, the **problem–solution pattern**, where by 'pattern' he means 'combination of relations organising (part of) a discourse' (Hoey 1983: 31).

Both Hoey and Winter show that the stylistic device of **repetition** [*see also* STYLISTICS] both connects sentences and contributes to sentence and text interpretation, 'because where two sentences have material in common, it is what is changed that receives attention by the reader, while the repeated material acts as a framework for the interpretation of the new material' (Hoey 1983: 25).

Repetition typically signals matching relations and general–particular relations. It may take the form of **simple repetition** 'of a lexical item that has appeared earlier in a discourse, with no more alteration than is explicable by reference to grammatical paradigms' (Hoey 1983: 108), e.g., *they* ***dance*** – *she* ***dances*** . Or it may take the form of **complex repetition**, in which a morpheme is shared by items of different word classes: *she* ***danced*** (verb) – *the* ***dance*** (noun) – *the* ***dancing*** *shoes* (adjective). Repetition may, however, also take the form of **substitution** in Hoey's system (in contrast with Halliday and Hasan 1989, who treat substitution as a subclass of ellipsis – see above). His signals of this type of repetition are the same as those listed by Halliday and Hasan (1989) (see above). Finally, **paraphrase** is also classed as repetition. For further analysis of patterns of lexical repetition in both spoken and written texts, see Tannen (1989) and Hoey (1991).

Repetition is the clearest signal of the **Matching** relation (Hoey 1983: 113): 'Matching is what happens when two parts of a discourse are compared in respect of their detail. Sometimes they are matched for similarity, in which case we call the resulting relation Matching Compatibility, and sometimes for difference, in which case we call the resulting relation Matching Contrast.'

The only types of text that are occasionally organised solely in terms of matching relations are letters and poems. Normally, the matching relation is used together with one of the general–particular relations (see below). This is because it is usual when matching pieces of information first to provide a generalisation which will make sense of the matching. In the case of letters, the reader's background knowledge may, however, supply the generalisation, and, in the case of poetry, supplying it may be part of the process of interpretation.

Hoey (1983: chapter 7) discusses two types of **general–particular** pattern, namely the **generalisation–example** relation, and the **preview–detail** relation, both of which, in combination with the Matching relation, may organise whole texts, or long passages of them. He shows, for instance, how two matching example sentences (Hoey 1983: 113), (2) for example, a map will only contain those features which are of interest to the person using the map. (3) Similarly, architects' models will be limited to include only those features which are of interest to the person considering employing the architect are prefaced with the generalisation for which they serve as examples:

> (1) It is interesting to note that iconic models only represent certain features of that portion of the real world which they simulate.
>
> (The sentences are from Alan Jenkin, 'Simulation Under Focus', *Computer Management*, March 1971: 38.)

In the case of a **preview–detail** relation, the detail member of the relation supplies information about the preview member, or about a part of it, and the details may be matched. The most typical detail member is definition. In the following example, sentence (1) is the preview, and sentences (2) and (3) matched details:

(1) The Danish word *hyggelig* is interesting, but difficult to master for foreign learners of the language.

(2) On the one hand, it can be used of situations in which one is comfortable, in a warm, snug, feeling-at-home sort of way.

(3) On the other hand, it can be used about a person who makes one feel comfortable and at home.

One can test for the preview–detail relation by seeing whether, if one asks after sentence (1), 'Can you give me more detail?, the following clauses do so.

The most typical discourse pattern is, however, the problem–solution pattern. Many texts can be treated as conforming to the pattern **situation – problem – response – evaluation/result** with recursion on response – that is, a response may itself cause a new problem, requiring a new response, etc. Hoey gives the example shown in Figure 1 (from Hoey 1983: 53).

The pattern can be revealed by questioning. After each of the sentences in Figure 1, a reader might ask a question like: What happened then? What did you do then? Or the pattern may be revealed by paraphrase using lexical signals (1983: 53): 'The *means* whereby I beat off the attack was by opening fire. The *cause* of my opening fire was that I saw the enemy approaching. The *circumstances* of my seeing the enemy approaching was that I was on sentry duty.'

The lexical signals used in the paraphrase may be the terms used in the pattern itself (Hoey 1983: 53): 'My *situation* was that I was on sentry duty. I saw the enemy approaching. I *solved* this *problem* by opening fire. This *achieved* the *desired result* of beating off the attack'.

Hoey (1983: 57–8) draws up four sets of mapping conditions which show the relationship between the problem–solution *pattern* and the *relations* between clauses:

1. We will assume two parts of a discourse, *a* and *b*, in a cause– consequence relation. *If (i) a* has been independently established as problem *and (ii) b* contains the role of agent, then *b* is response.
2. We will assume three parts of a discourse, *a*, *b* and *c*, of which *a* and *b* are in an instrument–achievement or instrument–purpose relation (purpose being more or less equivalent to hoped-for achievement), and of which *a* has not been independently established as a problem. Given these circumstances, if *(i) b* contains the role of agent *and (ii) c* prevents, reverses, avoids, avoids harm to, or seeks help in preventing, etc., some crucial aspect of *a*, then *a* is problem and *b* is response.

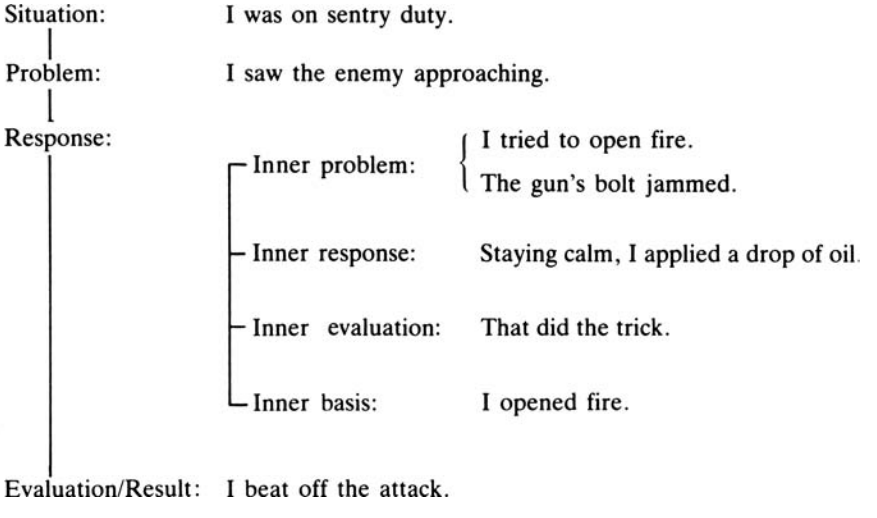

Figure 1

3. We will assume two parts of a discourse, *a* and *b*, in a cause–consequence relation and that *a* has not been independently established as problem. *If (i) b* contains the role of agent *and (ii) b* also prevents, reverses, avoids or avoids harm to some crucial aspects of *a*, then *a* is problem and *b* response.
4. We will assume the same as for mapping condition 3. *If (i) b* contains the role of agent *and (ii)* b also can have attached to it a purpose clause, *c*, which spells out a layman's understanding of what *b* means, and if *(iii)* the newly formed trio conforms to the conditions of mapping condition 2, then *a* is problem and *b* response.

Hoey's and Winter's approaches differ from that of de Beaugrande and Dressler (1981) and van Dijk and Kintsch (1978) in remaining fairly strictly on the surface of discourse (although making reference to such 'deep' roles as 'agent', as in the above), and in not emphasising the psychological processes of understanding and perceiving macrostructure (Hoey 1983: 33).

Instead, the emphasis is laid on the ways in which the surface of the discourse (not necessarily to be contrasted with hidden depths) contains sufficient clues for the reader/listener to perceive accurately the discourse's organisation.

This has the advantage that the phenomena described are fairly directly observable, while the reference to concepts and relations of the textual world and to schemata remains of a hypothetical nature. However, the two approaches are best seen as complementary; surface-structure linguists have provided valuable detailed work on cohesion and coherence; nevertheless, it would be naive to think that readers' cognitive processes and knowledge of various aspects of the world are not important in text comprehension. It might even be arguable that the reason why the problem–solution pattern is so fruitful for text analysis is that it closely matches those cognitive writer and reader processes which de Beaugrande and Dressler (1981) refer to in discussing the remaining five conditions of textuality.

In Hoey (1991), the topic of textual patterns is pursued further with particular reference to the ways in which particular lexical patterns cluster to establish topic coherence.

Intentionality

Intentionality concerns the text producer's intention to produce a cohesive and coherent text that will attain whatever goal they have planned that it should attain. Text producers and receivers both rely on Grice's co-operative principle [*see* PRAGMATICS] in managing discourse, but in text linguistics the notion of conversational implicature is supplemented with the notion that language users *plan* towards a *goal* (de Beaugrande and Dressler 1981: 132–3):

> Successful communication clearly demands the ability to detect or infer other participants' goals on the basis of what they say. … By the same token, text producers must be able to anticipate the receiver's responses as supportive of or contrary to a plan, for example, by building an *internal model* of the receivers and their beliefs and knowledge.

Acceptability

Acceptability concerns the *receiver's* wish that the text should be cohesive and coherent and be of relevance to them (de Beaugrande and Dressler 1981: 7): 'This attitude is responsive to such factors as text type, social or cultural setting, and the desirability of goals.' The receiver will be *tolerant* of things, such as false starts, which interfere with coherence and cohesion and will use *inferencing*, based on their own general knowledge, to bring the textual world together.

Informativity

Informativity 'concerns the extent to which the occurrences of the presented text are expected vs. unexpected or known vs. unknown/certain' (de Beaugrande and Dressler 1981: 8–9). Hence it needs reference to the notion of **probability** (de Beaugrande and Dressler 1981: 140) – the more probable in any particular context will be more expected than the less probable. When something very unexpected occurs (de Beaugrande and Dressler 1981: 144), the text receiver must do a MOTIVATION SEARCH – a special case of **problem-solving** – to find out

what these occurrences signify, why they were selected, and how they can be integrated back into the CONTINUITY that is the basis of communication.

If no solution is forthcoming, the text will appear as nonsensical.

A receiver's expectations of what will appear in a text are powerfully affected by their perception of what text type they are currently encountering. What is unexpected in a technical report may be less unexpected in a poem.

Most cognitive approaches to text analysis emphasise what readers bring to the text: the text is not a file full of meaning which the reader simply downloads. How sentences relate to one another and how the units of meaning combine to create a coherent extended text is the result of interaction between the reader's world and the text, with the reader making plausible interpretations.

Situationality

Situationality 'concerns the factors which make a text RELEVANT to a SITUATION of occurrence' (de Beaugrande and Dressler 1981: 9). Again, a text-receiver will typically try hard to solve any problem arising from the occurrence of apparently irrelevant items in text; that is, they will engage in problem–solution in order to make such items appear relevant.

Intertextuality

Intertextuality concerns the way in which the use of a certain text depends on knowledge of other texts. For instance, a traffic sign saying 'resume speed' only makes sense on the basis of a previous sign telling a driver to slow down. The interdependence of texts covered by the notion of intertextuality is responsible for the evolution of *text types*, which are groups of texts displaying characteristic features and patterns. Parodies, critical reviews, reports and responses to the arguments of others are highly and obviously reliant on intertextuality. In other cases, we are less aware of intertextuality. For instance, a novel we are reading may appear as an independent text; however, it relies on the tradition of novel-writing, and we bring our knowledge of what a novel is to the reading of it.

Regulative principles of textual communication

Efficiency

Efficiency depends on the text being used in communicating with minimum effort by the participants; that is, it 'contributes to *processing ease* … the running of operations with a light load on resources of attention and access' (de Beaugrande and Dressler 1981: 34).

Effectiveness

Effectiveness depends on the text leaving a strong impression and creating favourable conditions for attaining a goal. 'It elicits *processing depth*, that is, intense use of resources of attention and access on materials removed from the explicit surface representation' (de Beaugrande and Dressler 1981: 34).

Appropriateness

Appropriateness is the agreement between the setting of a text and the ways in which the standards of textuality are upheld. It determines 'the correlations between the current occasion and the standards of textuality such that reliable estimates can be made regarding ease or depth of participants' processing' (de Beaugrande and Dressler 1981: 34). It mediates between efficiency and effectiveness which tend to work against each other. Plain language and trite content (efficiency) are very easy to produce and receive, but cause boredom and leave little impression behind. In contrast, creative language and bizarre content (effectiveness) can elicit a powerful effect, but may become unduly difficult to produce and receive.

Naturalness

In text linguistics, then, the links between clauses are observed across sentence boundaries, and these links can be seen to form larger patterns of text organisation. In addition, however, reference to the text surrounding a given sentence may be seen to cast light on the naturalness of the sentence in question.

'Naturalness' is Sinclair's term for 'the concept of well-formedness of sentences *in text*' (1984:

203), and it is contrasted with what is normally thought of as sentence well-formedness, which is a property sentences may or may not have when seen in isolation. Sinclair argues that many well-formed sentences do not appear natural to a native speaker, and that, since these appear odd in spite of being well formed, they 'must violate some restrictions which are not among the criteria for well-formedness' (Sinclair 1984: 203), so that well-formedness and naturalness are independent variables.

Some of the determinants for the fulfilment of the criteria for naturalness are situated in the surrounding discourse, while those for well-formedness are all within the sentence itself. Thus *If you like* is not well formed by the traditional grammatical criteria, but is a natural response to a type of request. It contains what Sinclair calls a **range-finder**, an indication that an item in the **co-text** (the rest of the text) or **context** (the situation in which the text is being used) will render it unproblematic, the item being (in this case) the request preceding it.

The degree to which a sentence depends for its naturalness on its co-text and/or context is called its **isolation** – one of three parameters in terms of which statements about sentence naturalness can be made. Isolation also depends on **allowables**, so called because they are features of the sentence which, although dependent on co-text or context for their specification, do not interfere with its well-formedness. Allowables include pronouns, as displayed in the sentence *I wouldn't have bought* ***it*** *if* ***he*** *hadn't been* ***there*** (Sinclair 1984: 204; allowables in bold; bold and italics added). The allowables in this sentence do not render it ill formed, but they do indicate its dependence on the surrounding discourse, since that is where we would expect to be able to discover their referents, i.e. what *it*, *he* and *there* refer to.

In contrast, *Prince Charles is now a husband* is well formed by traditional grammatical criteria, but is not a natural sentence, chiefly because 'there is a conflict between the mutual expectations of the equative structure, the indefinite article, and the word *husband*. Words denoting occupations (e.g., *sailor*) would not cause this conflict'. The sentence violates the second parameter in terms of which naturalness statements are made – namely, **idiomaticity**.

Had the item *husband* been preceded by the item *good*, however, the sentence would have been far more natural than it is. An item which has this effect on naturalness is called a **supporter**. The notion of support rests on the notion of collocation, the tendency which linguistic items have to occur with certain other items. When expectations about collocation are fulfilled in a sentence, it will display **neutrality**, a further parameter for statements about naturalness. Supporters also affect idiomaticity, so that in the sentence *I'm trying to rack my brains* (Sinclair 1984: 203ff.) the very low expectation of collocation between *trying* and *rack my brains* contributes considerably to its low status on the scale of idiomaticity and to its consequent non-naturalness.

For further discussion, see Sinclair (1991).

K. M. and R. A. C.

Suggestions for further reading

Beaugrande, R. de and Dressler, W.V. (1981) *Introduction to Text Linguistics*, London and New York: Longman.

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Tone languages

All the languages in the world use consonants and vowels to build morphemes, which in turn join together to form words. Thus the English word *me* is made up of a nasal consonant followed by a high vowel. If we change the consonant to a /b/ we would get a different word, *be*, and if we change the vowel to a low vowel, we would also get a different word, *ma*.

We may pronounce the word *ma* with various pitch patterns, depending on the occasion. We may pronounce it with a high pitch if we are emphatic; we may say it with a rising pitch in a question, etc. But these different pitch patterns do not alter the word in the way that changing a consonant or changing a vowel does. These

different pitch patterns that do not change, but merely add to the basic meaning of words, are called **intonations** [*see* INTONATION].

Yet there are some languages in the world that use pitch patterns to build morphemes in the same way consonants and vowels are used. The best-known such language is Chinese, as illustrated in Figure 1 (Wang 1973).

As the figure shows, the syllable *ma*, when pronounced with a falling pitch pattern, means 'to scold' in the **Putonghua** dialect of Chinese. (*Putonghua*, which literally means 'common speech', is the speech form sponsored by the People's Republic of China. It is a variety of Mandarin.) When pronounced with a rising pattern, the meaning is 'hemp'; when pronounced with a high-level pattern, the meaning is 'mother', as in some dialects of English; and lastly, when pronounced with a low dipping pattern, the meaning is 'horse'.

When pitch patterns are used in this lexical capacity, i.e. to build words and morphemes much as consonants and vowels do, they are called **tones**. And languages that use tones in this way are called **tone languages**. Putonghua, then, is a tone language. It has four tones, as illustrated in Figure 1.

Tones are different from consonants and vowels in a fundamental way. Whereas the latter are formed primarily in the mouth, by movement of the tongue, the velum, the jaw, etc., tones are formed primarily at the larynx – a box of cartilages situated at the top of the windpipe – which contains the vocal folds. One cycle of vibration of the vocal folds is the phonetic basis of sound in speech [*see also* ARTICULATORY PHONETICS].

During speech, the folds vibrate very rapidly – so rapidly, in fact, that when we look at them with the aid of a dentist's mirror, all we can see is a blur at the edges. The typical rate of vibration of the vocal folds, the fundamental frequency, abbreviated **F0**, is around 100 cycles per second (**cps**) for men and around 180 cps for women and children.

Variation in F0 is controlled by pulling the vocal folds toward the rear with different degrees of tension. As the folds are pulled more taut, somewhat in the manner of stretching a rubber band, they become thinner and vibrate at a higher frequency. The higher the frequency, the higher we perceive its pitch to be. So **frequency** is a physical concept, while **pitch** is a psychological one, i.e. the ear's response to frequency. The two scales are not identical, but they are sufficiently similar for our purposes here, so that we may interchange them for convenience.

We automatically normalise pitch for each speaker according to the pitch range we expect. When a man says *Hello*, his average F0 may be around 100 cps. When a woman says *Hello*, her average F0 may be around 180 cps. Yet we understand them to be saying the same linguistic thing, in spite of the great difference in the physical signal. Similarly, in a tone language the F0 of a tone is evaluated relative to the F0 average and the F0 range of the speaker. This relative mode of perceiving tone allows us constantly to adjust the baseline and range of F0 in the utterance. As a result, different F0s may be linguistically the same, as in the *Hello* example above. Conversely, the same F0 may be evaluated as linguistically different.

A system of notation for tones, called **tone letters**, was proposed in 1930, which is widely used for describing the tone languages of East and Southeast Asia (Chao 1930). In this notation, a vertical line is used to represent the pitch range of the tones. The top of the line corresponds to the highest pitch, or value 5. The bottom of the line corresponds to the lowest pitch, or value 1. The middle of the vertical line corresponds to a mid pitch. A high-level tone would be represented by a horizontal line drawn from the left to the top of the vertical line. Such a tone may be described numerically as '5–5', or simply '55'.

We may now refer back to the four tones of Putonghua, as shown in Figure 1. There we see the F0 of these four syllables, as spoken by the present author and analysed by computer. The top tone, for the meaning 'to scold', may be described as '51', since the F0 starts high and falls low. (The small rise at the beginning may be explained as an effect of the consonant and is irrelevant to the basic pattern of the tone.) The next one down may be described as '35', a rising tone. The next one down, meaning 'mother', is level enough to be described as '55'. And, lastly, the bottom one may be described as a dipping tone, '424'.

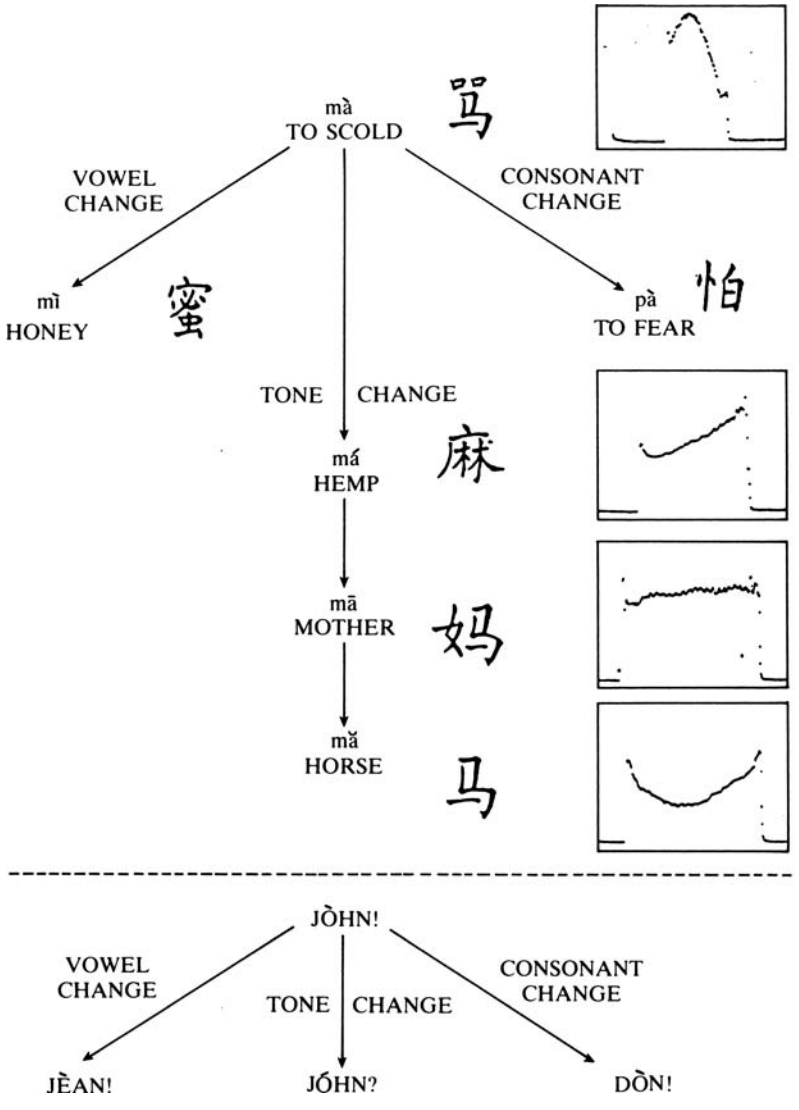

Figure 1 The four tones of Putonghua Chinese (from Wang 1982: 58). TONES are used to alter the meaning of Chinese words. Standard Chinese has only four tones: falling (as in mà), rising (as in má), level (mA), and dipping, or falling and then rising (mã). The oscillograph traces at the right show the fundamental frequency of the author's voice as he spoke the words. In English, on the other hand, variation in tone is used to convey different moods; the meaning of the words being spoken does not change. In Chinese, changing tone has the same kind of effect on the meaning of a word as changing a vowel or a consonant.

There are many different linguistic systems which use more than four tones. The dialect of Chinese spoken in Guangzhou and Hong Kong, popularly called **Cantonese**, has nine tones (Wang and Cheng 1987). In Figure 2 we see again the computer tracings of the F0 of the speaker's voice. For the six long tones in the left columns and the middle column, the syllable pronounced is /si/, as in the English word *see*.

So we see in the upper left corner the F0 pattern for a high-level tone, shown on the computer screen as 160 cps. (The 'HZ' in the

figure is the abbreviation for 'hertz', which is equivalent to cps.) The meaning is 'poetry'. Compare this with the mid-level tone in the lower left corner, at 131 cps, where the meaning is 'to try'. The other four long tones in these two columns have the meanings 'history', 'time', 'city' and 'yes'.

In Cantonese, the short tones occur only on syllables that end in plosive consonants, i.e. /p/, /t/ or /k/. These tones are short because they are stopped by these consonants; notice that they are less than half the duration when compared with the long tones. Strictly speaking, then, the short tones are never in minimal contrast with the long tones, because the long tones never occur on syllables that end in stop consonants. The syllable illustrated in the column to the right in Figure 2 is /sik/. Pronounced with a high tone it means 'to know', and with a low tone it means 'to eat'. Pronounced with a mid tone it occurs in the name of a Chinese city, Wuxi.

The question naturally arises as to the maximum number of tones a language can have. Is there an upper limit? A theory of tones has been proposed to answer this question (Wang 1967). This is shown in Figure 3. The theory states that the maximum number is thirteen, as shown by the tone letters in the figure. Furthermore, the theory states a maximum for each of the five categories of tones. The maximum for level tones is five. And the maximum is two for each of the other four categories: rising, falling, concave, and convex.

It is interesting to note that for the Putonghua system discussed earlier there is one level tone (55), one rising tone (35), one falling tone (51) and one concave tone (424). This is a rather typical distribution. It is as though the language selects from as many categories as possible, rather than fills up its inventory with just one or two categories. In this respect, tones behave much like consonants and vowels in their selection process (Lindblom 1989).

Consonants, too, tend to be selected a few from many categories, rather than many from a few categories. Notice that in English, plosives, affricates, fricatives, nasals and liquids are all represented, but only a few from any one category. We can make the same observation about vowel systems. This similarity in the selection process suggests that tones too may be factored into a smaller set of phonological features, as has been done for consonants and vowels. This is the plan shown in Figure 3. The maximum set of thirteen tones can be analysed into seven binary features.

The Cantonese system illustrated in Figure 2 is an unusually complex one in terms of its tone inventory. There are tone languages all over the world, and most of them have a simpler inventory of tones. In part, this is due to the fact that the majority of morphemes in these languages

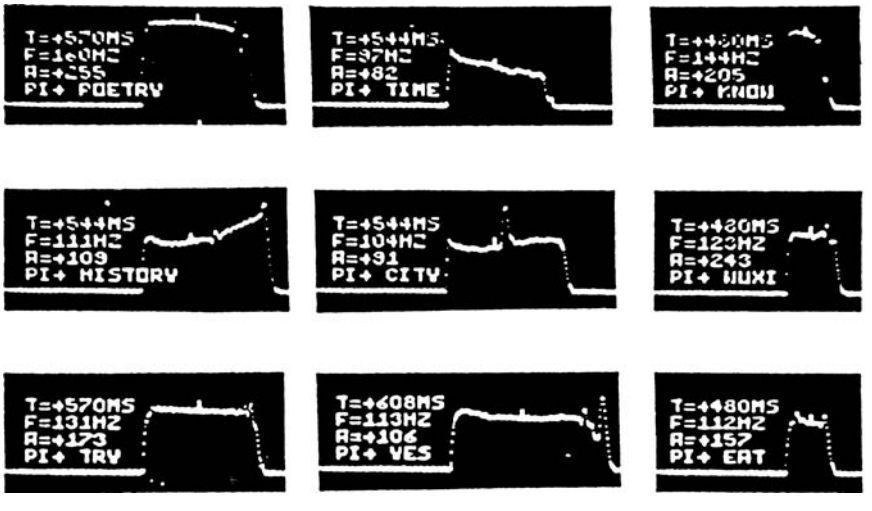

Figure 2 The nine tones of Cantonese (from Wang and Cheng 1987: 515).

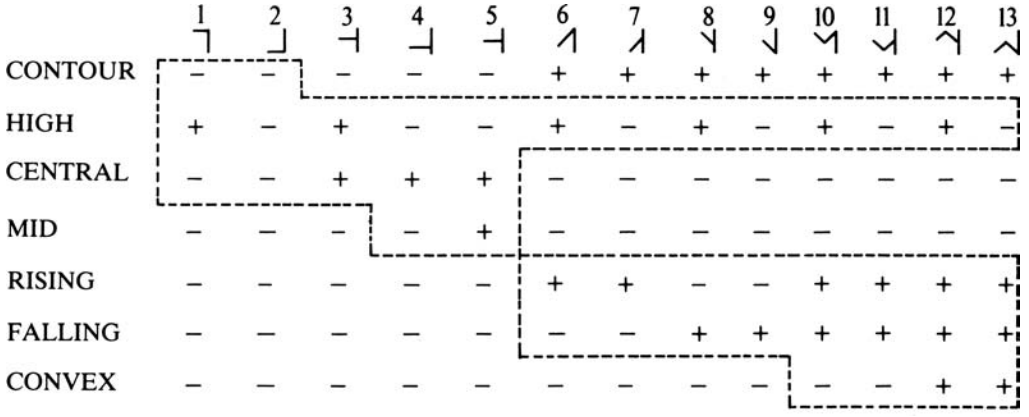

Figure 3 Phonological features of tone (from Wang 1967: 103).

are polysyllabic, as opposed to Chinese, where most morphemes are monosyllabic. A language with two tones can have eight distinct tone sequences over three syllables, i.e. 2 æ 2 æ 2.

Below is a set of examples from **Kikuyu**, a Bantu language spoken in Kenya, where seven out of the eight possible sequences of high (H) and low (L) are actually used to build morphemes (McCawley 1978: 127). The only sequence not used is HLL. (The phonetic notation has been simplified here.)

HHH	*hengere*	'slab'
HHL	*ngauro*	'person with shaved head'
HLH	*tingori*	'large boy not circumcised with his age-mates'
LHH	*remere*	'way of cultivating'
LHL	*bariti*	'anger'
LLH	*boboto*	'downpour'
LLL	*beredi*	'leaf-shaped spear'

Tones as a linguistic topic were discussed in China as early as 1500 years ago, by the scholar Shen Yue (441–513). It is now well known that most of the languages of China and South-East Asia are tone languages, perhaps due to extensive mutual influence through the millennia. In Western scholarship, an early study of this topic is by Beach (1924), on the Bantu languages of East Africa. Kikuyu, exemplified above, is one such language. Another Bantu language whose tone system has been studied extensively recently is **Makua**, spoken in southern Tanzania and in Mozambique (Cheng and Kisseberth 1979–81). Numerous languages of West Africa are tone languages as well. Furthermore, these languages offer much important data for linguistic theory, as discussed by Hyman and Schuh (1974).

Among the languages of native America, many are tonal. A classic work on the study of tone languages is that by Pike (1948), which gives in-depth analyses of two Amerindian languages of Mexico, **Mazatec** and **Mixtec**. The presence of a step-up tone is an especially intriguing phenomenon of the tone system of one of the Mixtec dialects, that of the town of Acatlan in central Mexico. (This phenomenon was discovered after the publication of Pike's book.)

The effect of the step-up is to raise the pitch of the syllable one step higher than the pitch of the preceding syllable, if the preceding syllable carries a high tone or a step-up tone. When a sequence of step-up tones occurs one after another in a sentence, it sounds a bit as if the person is singing a musical scale rather than speaking (Wang 1972).

This phenomenon is all the more intriguing when we consider the so-called **terrace-level** tone languages of West Africa. In these languages, there is a **step-down tone**, which has the opposite effect of the step-up in Mixtec. Due to a complex interaction between these tones and the intonation of the sentence, the auditory effect is like going down a terrace, one step at a time.

Tone languages occur widely in Africa, Asia and among the American Indians. They occur also in Europe. Among Germanic languages, Norwegian and Swedish are tonal, in that a word

can be classified according to two 'accents' differing primarily in their F0 pattern (Garding 1973). Among Slavic languages, Serbo-Croatian and Slovenian are similar in this respect. Similar observations have also been made for **Lithuanian**, a Baltic language.

There is in fact a wide spectrum of criteria for what constitutes a tone language. The criteria may rest with the tone features used in the system (e.g., does it have contour tones?), with the lexical versus morphological function of the tones, and with the degree to which the various tones may be predicted on the basis of grammatical information. Some efforts have been made to construct a typology of tone languages, e.g., Wang (1972) and McCawley (1978). However, no comprehensive framework which has gained general usage has yet been worked out.

Earlier in this article, I indicated that, unlike consonants and vowels, tones are produced primarily at the larynx. However, the activities of the articulators above the larynx frequently have a significant influence on the F0. This influence may be manifested physiologically and acoustically.

Physiologically, different consonants and vowels are produced with different degrees of pull on laryngeal structures. This means that, everything else being equal, consonants and vowels may have distinct F0 patterns associated with them.

Acoustically, different sounds produce different degrees of opening within the mouth, which in turn influences the pattern of airflow through the larynx. Thus, a consonant may be voiced, aspirated or glottalised; this has a clear effect on the F0 of the following vowel. Such effects have been extensively documented in the phonetic literature, sometimes under the term **intrinsic variation**, to suggest that the variation in F0 is due to the mode of production of the sound itself (Mohr 1971). As a result of these physiological and acoustic factors, certain tones are favoured over others. For example, Cheng (1973), in a quantitative study of over 700 tone systems, found that high tones are used more often than low tones, and falling tones more often than rising tones.

How does a language acquire a tone system? The answer to this question may be sought in these intrinsic variations. Take, for example, the English words *bin* and *pin*. As suggested in the spelling, we consider the main distinction between them to be due to the initial consonant, i.e. /b/ versus /p/. But a careful analysis will show that the F0s of the two words are also quite different. The F0 of *bin* starts much lower and has a lower average value as well. Suppose that, at some future point in time, the distinction between /b/ and /p/ is lost; that is, suppose that /b/ changes into /p/, a rather common sound change in the languages of the world. At that point, English will become a tone language, since the two words will then be distinguished exclusively by the two F0 patterns (i.e. the two tones).

Such a scenario is very plausible. In fact, many scholars feel that this is how Chinese became a tone language several thousand years ago. Presumably, this came about precisely through the loss of consonantal distinctions. It is a two-step process: first the consonants cause the F0 to vary, then the distinction shifts over to the F0 when the consonants merge or become lost (Wang and Cheng 1987).

A tone language may also lose its tone system. This is probably the case with Swahili, a widely used language of the Bantu family. Almost all of the Bantu languages have tones, such as the Kikuyu example discussed earlier. However, because Swahili was used for a long time as a trade language in East Africa, it imported a large number of non-Bantu words, especially from Arabic languages. This importation was presumably implemented through the medium of many bilingual speakers of Arabic and Swahili. These speakers probably stopped using tonal distinctions on more and more Swahili words as they switched back and forth between the two languages, since Arabic is not a tone language. Through the decades, the tone system in Swahili was eroded, until it became lost completely.

In conclusion, a few general remarks on the nature of tone languages. Because such systems are so dependent on F0, the questions naturally arise as to what happens to intelligibility when F0 is absent (as during whispering) and when the speaker has to follow a melody line (as in singing). The answer is that intelligibility is largely preserved in both cases. Briefly put, this is because there are a number of secondary cues in the signal which accompany these tones, such as duration,

loudness, contour, vowel quality, etc. These cues take on increased perceptual importance when F0 is not fully available.

Finally, the question of the relation between linguistic tones and music is often raised. It appears that speakers of tone languages have no special advantage in learning music. In fact, they may be quite tone deaf musically, and yet use tones with normal facility. At the same time, neither is there any evidence that people who are exceptionally gifted in music have any special advantage in learning tone languages.

These observations are not surprising when we note that the resemblance between music and linguistic tone is really quite a superficial one – they share only some of the raw materials each is made of. Tones can be decomposed into phonological features, as we have seen in Figure 3. In addition, tones are perceived in terms of linguistic categories (Wang 1976), as is the case with consonants and vowels. Furthermore, tones appear to be processed more in the left hemisphere, together with consonants and vowels, rather than in the right hemisphere, with music (Van Lancker and Fromkin 1973).

The evidence is quite strong, therefore, considered both from the viewpoint of internal phonological organisation and from laboratory experimentation, that tones behave much like consonants and vowels in their contribution to building words. Through the chance of historical development, we find today that some languages make use of tones while other languages do not. But the pattern is a changing one, since historical development makes it possible for a tone language to lose its tones, and for a non-tone language to become one.

W. S.-Y. W.

Suggestions for further reading

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Pike, K.L. (1948) *Tone Languages*, Ann Arbor, Mich.: University of Michigan Press.

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W

Writing systems

Introduction

In the modern industrial society, writing is so obviously important that we take it for granted. An illiterate person is viewed as seriously handicapped. Yet, until about 200 years ago, the majority of people were illiterate, and in some parts of the world this is still true. For most of us, however, modern daily life depends heavily on writing where it is central in education and in many types of work as well as in providing us with a significant source of pleasure. We are surrounded by newspapers, magazines, books, signs, and computer text.

We must distinguish carefully between writing and language. Language is an innate ability of human beings. We all learn to speak with no formal training. Writing, however, is not innate; it must always be consciously taught and learned. Children only learn to read and write some years after they have learned to speak.

Language is a complex system relating sound and meaning. Writing is a graphic representation of a linguistic utterance. This definition of writing rules out pictures as writing. Pictures or drawings may indeed communicate, perhaps reminding the viewer of a story or event, but they are not writing in this sense because they do not represent specific linguistic utterances. A picture of a man fishing might be read in English as *The man is fishing*, *The man hopes to catch a fish*, *The man enjoys fishing*, or many other ways. The sentence *The man is fishing*, however, can only be read aloud in one way; to read this sentence as *The man hopes to catch a fish* or even with such a small difference as *The man was fishing* would be regarded as wrong.

History

Writing is relatively recent in human life, no older than about 5,500 years; human beings were speaking millennia earlier. Writing has only been invented three times from scratch. Much more often it has been borrowed from and applied to a different language. The invention of writing requires acquiring the notion that symbols can represent linguistic units, e.g., words, and then ways must be developed for writing any word in the language. If writing did not exist today, we might possibly create a writing system for English in this way: for the word *eye*, we might create a picture of an eye (see Figure 1); such a creation is called a pictogram, an element of a writing system, because it is a graphic way of representing a specific linguistic utterance, namely the word *eye*.

Then, we might use semantic extension to extend the meaning of this symbol to other words of a similar meaning, such as *see* or *vision*. We might also extend the meaning of this symbol to the pronoun *I* using phonetic extension. In both types of extension, we would have to rely on the context to tell us which word was intended. If sorting out these different meanings for this symbol became too difficult, we might differentiate them with extra marks. For the verb *see*, we might add an arrow to indicate symbolically the action of a verb. For *I*, we might make a compound of the eye and a stick figure for a person. Using these and other devices, we could create symbols adequate to write an entire language. Today, we can see that Sumerian cuneiform and Chinese characters were created using these principles.

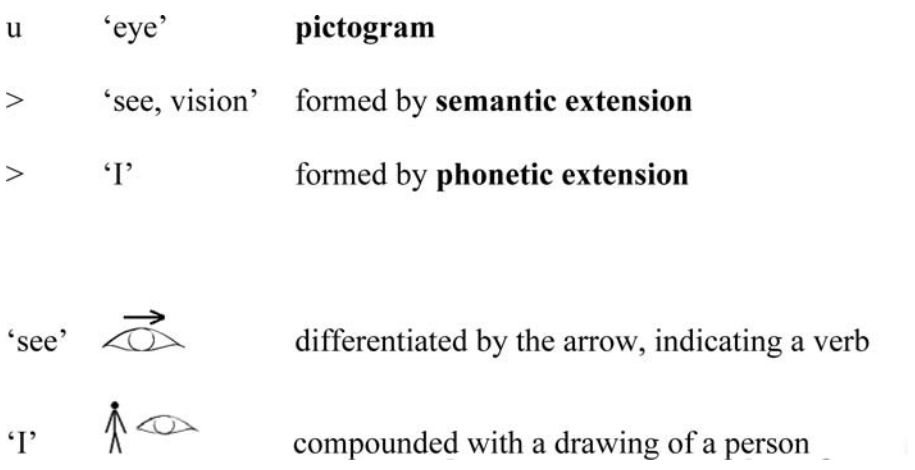
u 'eye' pictogram
> 'see, vision' formed by semantic extension
> 'I' formed by phonetic extension
'see' differentiated by the arrow, indicating a verb
'I' compounded with a drawing of a person

Figure 1 The original pictogram for 'eye' is extended semantically and phonetically to serve as the symbol for other words. The last two symbols show how new symbols could be formed so as to reduce ambiguity.

We are certain that writing was independently invented three times. First, in Mesopotamia by the Sumerians about 3300 BCE. Second, in China about 1500 BCE. And finally by the Mayans in Mesoamerica (southern Mexico and neighbouring areas) between 500 and 300 BCE.

Living in Mesopotamia, the Sumerians had small clay geometrically shaped objects called *tokens* for accounting purposes. They made bookkeeping records by pressing these objects into clay tablets, then they began to draw the image with a pointed stick, and finally used a triangular stylus to make wedge-shaped symbols (see Figure 2). Their writing is known as cuneiform. Using the principles mentioned above, the Sumerians created a writing system capable of writing any utterance in the language. The Akkadians, speaking a very different language, conquered the Sumerians in the second millennium BCE and adapted cuneiform writing to their own Semitic language Akkadian. Some symbols represented morphemes, and some represented sounds, generally consonant-vowel sequences. Although Akkadian writing was extremely complicated and required considerable schooling to master, it enjoyed enormous success with the last known text written in the first century CE.

The earliest known Chinese writing is the oracle-bone inscriptions; these are texts on bone or shell predicting future events. Chinese writing today is essentially a direct continuation of this early writing. Although the inventory of characters and the calligraphic style of writing has changed over the centuries, the structural principles of the writing system have remained very much the same. Chinese writing was borrowed by neighbouring cultures and adapted for Korean, Japanese, and Vietnamese.

The surviving documents from Mesoamerica in Maya are primarily stone tablets of an historical

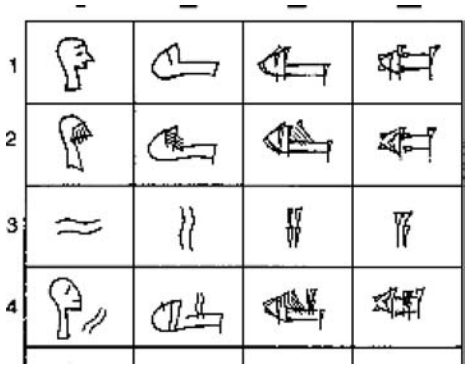

Figure 2 Some cuneiform symbols. Earlier forms of the symbols are on the left, later ones on the right. The original pictograms were rotated 90°, and then were written with a wedge-shaped stylus. Row 1 shows the symbol for *head*. Row 2 shows the symbols for *mouth*, being a modified form of *head*. Row 3 is a pictogram for *water*. Row 4 shows a compound symbol of *head* + *water* for the word for *drink*.

nature; most texts were written 250–900 CE. These texts are notable for their very careful calendrical details. Circumstances in the Mayan world changed causing writing to become considerably less common around 1000 CE, and it died out entirely around 1600 although Mayan languages continue to be spoken in the area today. Knowledge of the writing system was lost, and modern decipherment of the Maya texts only dates from the 1950s.

The Egyptians likely borrowed the notion of writing from the Sumerians around 3000 BCE although some scholars argue that Egyptian writing is an independent invention. Although Egyptian writing is also a mixture of morphographic and phonographic writing (see below), it is pictorially and structurally quite different from cuneiform writing. It is also quite complex, but it lasted until around 450 CE.

Semitic-speaking peoples from the eastern end of the Mediterranean likely acquired writing from the Egyptians around 1500 BCE. They simplified the system considerably to under 30 symbols; these were used to represent only the consonants; such a system is known as an abjad (see the discussion of Arabic below). This Semitic writing spread to all the Semitic languages in the area including Phoenician, Ethiopian, Hebrew, Aramaic, and Arabic. It spread eastwards to other languages across Asia. Most likely it is the source of, or at least had a strong influence on Brahmi of India which is the ancestor of all the native scripts of India, Tibet, and most of Southeast Asia. Today, this Semitic writing is used for several languages, principally Arabic and Hebrew; it is written in lines running from right-to-left.

The Phoenicians, a Semitic people of the Syria-Lebanon area, brought their script to Greece. The Greeks adjusted the Semitic writing system slightly by adding vowels producing the first alphabet and changing the direction of writing to left-to-right. The Greek alphabet was borrowed and adapted for several languages: Coptic, Armenian, Georgian, Slavic, and Gothic. Significantly, it spread to Italy and was adapted to Latin, becoming the Roman alphabet which spread throughout western Europe. Since the Middle Ages, the Roman alphabet has become the most widely used script in the world.

Today, all writing in the world is derived from either the Chinese or the Semitic scripts or was created in a social context where such scripts were in use.

Structure

General

Writing can generally be divided into two broad categories: phonographic – where the symbols represent units of sound in a language, or morphographic – where the symbols are related to morphemes. Phonographic systems are by far the more common. Most phonographic systems are alphabetic where a symbol relates to a single phoneme; the Roman, Greek, and Cyrillic alphabets are examples of these. But some phonographic systems are moraic, such as Japanese *kana*, where each symbol represents a mora, i.e. a CV (consonant-vowel) or C (final consonant) sequence in the language.

Writing systems seem never to be pure. Chinese writing is strongly morphographic, but it has a considerable phonographic aspect as well. The use of Arabic numerals in alphabetic writing is morphographic. Further, the common English way of writing different morphemes which sound the same differently is morphographic in nature in that it distinguishes the morphemes from each other: *too – two – to; ewe – you – yew – U(-turn)*.

Chinese

Although Chinese writing requires the writer and reader to learn a sizable number of characters, it has a rather simple relationship to the language. The rule is that each syllable is written with one character, and each character represents one syllable. The majority of Chinese morphemes have only one syllable and thus are written with one character. Although in Chinese it is very common for different morphemes to be homophonous, i.e. to sound the same, these different, but same-sounding morphemes are written with different characters.

Some morphemes have two syllables and thus are written with two characters. Words in Chinese commonly consist of more than one morpheme and are thus also written with more than one character.

Until 1900, Chinese was normally written in a dialect known as Classical Chinese; this dialect

Figure 3 Chinese. Each of these different words above is pronounced /xī/, but each has a different character.

was not mutually intelligible with any spoken variety of the language. Everyone spoke their native dialect, but wrote the same, i.e. in Classical Chinese. From around 1900, writing has been in the Mandarin dialect, essentially the dialect of the capital Beijing. Thus, for the speakers of Mandarin, who live in the north and west of China, they write much as they speak. For the speakers elsewhere, e.g., Shanghai or Canton, their spoken language is a different and mutually unintelligible dialect from their written Chinese. Today all Chinese is written in the same dialect – Mandarin; thus the unity of Chinese writing continues although the dialect used for writing has changed from Classical Chinese to Mandarin.

Chinese writing was borrowed by other cultures, and Chinese characters are still used strongly in Japanese writing, and to a reduced extent in Korean. Calligraphy is a highly valued art in Chinese, Japanese, and Korean societies.

Previously, Vietnamese was written with characters borrowed from Chinese together with many characters invented in Vietnam but not used elsewhere.

Since around 1900, Vietnamese has been written with a version of the Roman alphabet.

Arabic

Arabic is the most widely spoken Semitic language today. Like other Semitic writing, it is written in horizontal lines going from right to left. As a whole, the letters in a word must be joined and not written separately; this situation results in letters having various shapes depending on where they occur in a word. Structurally, the Arabic script is considered an **abjad;** an abjad is like an alphabet except that only the consonants are written. In Arabic long vowels are in fact regularly written, but short vowels are not normally indicated although there are diacritics for showing the short vowels where desired. Short vowels are normally written in the Qur'an and in materials for children and learners. Calligraphy is highly valued in Arabic culture, and a large number of different calligraphic varieties exist. The expansion of Islam has meant that the Arabic script has been adapted for writing a large number of other languages, such as Persian, Urdu, and many others across Asia.

Arabic is diglossic in that speakers of Arabic mostly use their local dialect for speaking, but use a common dialect called Modern Standard Arabic for writing. The spoken and the written dialects are not mutually intelligible. Modern Standard Arabic is similar to, but not exactly the same as, the Arabic of the Qur'an. Modern Standard Arabic is used in university lectures, in the news on television, and in other relatively formal situations, but it would be felt to be pretentious for ordinary conversations. Similarly, it is perfectly possible to write a local dialect, but that would generally be regarded as undignified.

Devanagari

Devanagari is the script used for writing Sanskrit, Hindi, Marathi, and Nepali. It is typical of the scripts of south Asia. Structurally the script is called an *abugida* (see Figure 4). In an abugida, each consonant has a symbol. Vowels following a consonant are written with a diacritic on the consonant symbol. The short vowel /a/ is not written; thus the absence of a vowel symbol means that an /a/ is present. Initial vowels are written with special symbols. Consonant clusters are written by combining the consonant symbols into a ligature, i.e. a single symbol formed by combining two symbols. All the native writing systems of India are structurally abugidas.

asampatti 'non-success'

<a s mp i tt>

असम्पत्ति

Figure 4 Sanskrit written in the Devanagari script. The writing of the word *asampatti* 'non-success' is shown; the transliteration in angled brackets identifies the individual Devanagari symbols. The initial /a/ is written with its own symbol; the next two /a/'s in *asampatti* are not written; the absence of a vowel symbol signals the presence of /a/. The symbol for /i/ precedes the symbol after which it is pronounced; thus, the sequence /tti/ is written as <itt>. The sequences /mp/ and /tt/ are written as ligatures; the single symbol for /m/ is म, for /p/ is प, and for /t/ is त. In the ligature for /mp/, the vertical stroke of the symbol for /m/ is removed and the two symbols are joined. The symbol for /tt/ is slightly unpredictable; the first /t/ is represented by a horizontal bar attached to the regular symbol for /t/.

Roman writing

a) Finnish Finnish writing is alphabetic, and is often cited as being one where the relationship between phoneme and symbol are very close to a one-to-one relationship, i.e. each phoneme is represented by one symbol, and each symbol represents one phoneme.

b) English English writing is alphabetic also, but it is often cited as being one where the relationship between phonemes and symbols is very complex. (Note: angle brackets < > are used to show the spelling; slant lines show pronunciation / /.)

(1) Similar sounds are often spelled differently: /ow/ in go, foe, row, sew, dough; /sajt/ sight, cite, site; /-sid/ in proceed, precede, supersede.
(2) Similar spellings are often pronounced differently: tough, though, trough, through; does /dowz/ 'female deer (pl.)' and /dʌz/ 'performs'
(3) Some sounds are regularly written by two symbols: /ʃ/ sh, /θ/ th.
(4) The symbol <x> often represents a sequence of two sounds /ks/: tax /tæks/.
(5) Many letters are not pronounced: palm /pɑm/, lamb /læm/.
(6) Usually a final <e> is not pronounced, although it often provides information about the pronunciation of the preceding vowel: rate /rejt/, kite /kajt/, rode /rowd/, nude /njud/.
(7) Some very common words have unusual spellings: of /ɑv/, is /ɪz/, one /wʌn/, two /tu/.
(8) Some less common words have unusual spellings: hiccough /ˈhɪkˌkʌp/, victuals /ˈvɪtəlz/, boatswain /ˈbowsən/.

Japanese

Japanese has the most complicated writing system in use today. Historically, Japanese borrowed Chinese writing. However, a character was typically borrowed along with the Chinese word it represented. A character was used to represent this Chinese word, but the same character was also used to represent the corresponding Japanese word. For example, the same character is used to write the native Japanese words /itsu/ meaning 'five', but in other contexts it is also used to write the borrowed Chinese word /go/ also meaning 'five' (see Figure 5). As a result of this history of borrowing, almost all Chinese characters have a Japanese reading (called the *kun*-reading) as well as a Chinese reading (called the *on*-reading). Today, the native Japanese word and the borrowed Chinese word are usually found in

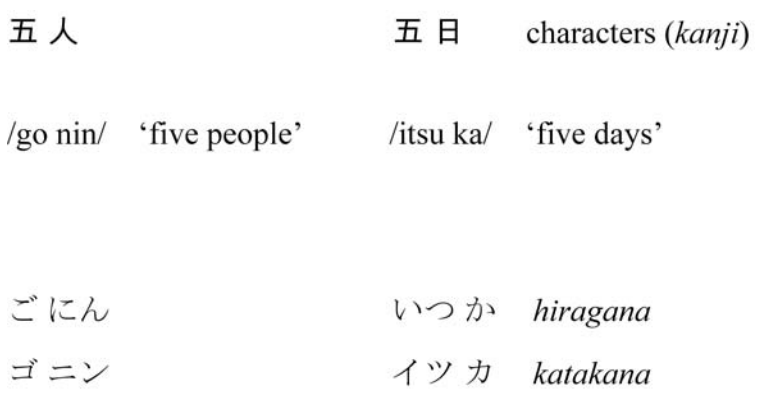

Figure 5 Japanese. The phrases for *five people* and *five days* are given in characters (*kanji*), *hiragana*, and *katakana*. The same character for *five* is used in both phrases, but it is pronounced as /*go*/ or /itsu/. /go/ was originally borrowed from Chinese and is called the *on* reading; /*itsu*/ is the original native Japanese word and is called the *kun* reading. The context tells the reader which reading is appropriate. In the lines below, the *hiragana* and *katakana* transliterations for each item are given.

different environments, although with the same meaning and they are written with the same character.

Over time, simplified forms of characters were used purely for phonographic purposes. This system known as **kana** now has a symbol for each **mora** in Japanese, i.e. for each CV cluster or syllable-final–C in the language. In principle, any utterance could be written in *kana*, but in fact Japanese is written with a mixture of characters (called **kanji**) and *kana;* often the root of a word is written with *kanji* and suffixes are written with *kana*, but some words are written entirely in *kanji* or *kana*. As a further complexity, there are two equivalent systems of *kana*, known as **hiragana** and **katakana**. *Hiragana* is the more neutral form and is used for writing suffixes, but *katakana* is used for emphasis, for certain onomatopoetic words, for telegrams, and for borrowed words. After World War II, the government moved to limit the number of characters in use to 1945 although in practice more are actually used, especially in proper names. Despite being a very complicated writing system, literacy in Japan is essentially 100 per cent. Children typically start school, already having learned to write *hiragana* at home.

Cree

Cree is an Algonquian language spoken in northern Canada. The script is often called Cree Syllabics. It was created in the nineteenth century by John Evans, a Methodist missionary. The script is widely used by the Cree and has been adapted for use by other languages such as Inuktitut.

The Cree script is unique in its nature. CV sequences are written by a single symbol. The consonant is shown by the shape of the symbol, and the vowel is shown by the orientation, i.e. the rotation of the symbol.

Transliteration and Romanisation

Scholars find it useful to represent foreign writing in the script of their own language. For example, English-speaking scholars often convert other scripts to some version of the Roman alphabet, a process known as Romanisation. Standard Romanisation exist, for most non-Roman scripts, although there are often more than one Romanisation in use. For example, until the late twentieth century, the Wade-Giles system was most commonly used for Romanising Mandarin Chinese (e.g., Mao^{2} Tse^{2}-tung^{1}); since then the Pinyin system has become standard (Máo Zédōng). Mandarin has four distinctive

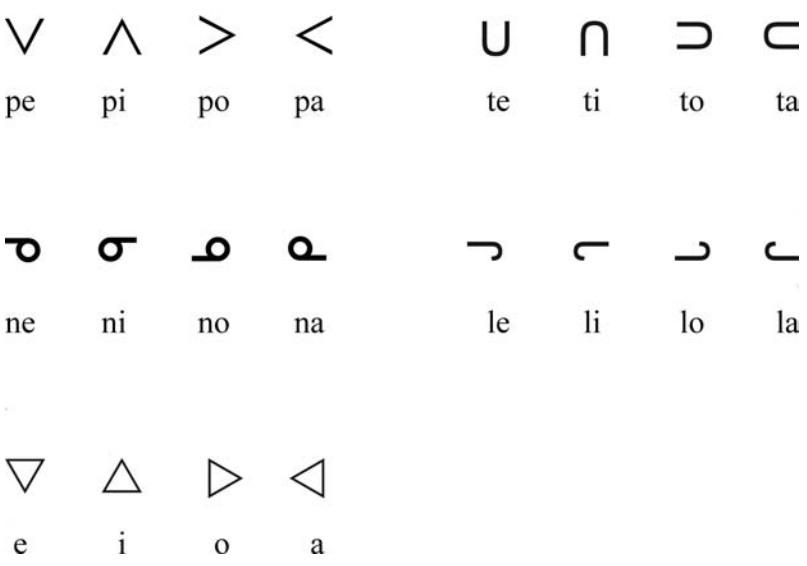

Figure 6 Some Cree symbols. The consonant is shown by the shape, and the vowel is shown by the orientation. The triangle in the last set shows that there is no initial consonant in the syllable, only a vowel.

tones: these are indicated by small raised numbers in Wade-Giles, and by accent marks in Pinyin.

In certain situations, it is useful to distinguish *transliteration*, which shows the orthography, and *transcription* showing the pronunciation. Thus, the word for *Japan* in Japanese is /nippon/. This is written in *hiragana* with four symbols as にっぽん. Here, each hiragana symbol represents a single mora, or CV or –C sequence. The transliteration of this is <ni Q po N> . (Note that <Q> represents a syllable-final sound which is the same as the following consonant, and N shows a syllable-final nasal.) This transliteration provides a one-to-one relationship from each *hiragana* symbol to Roman letters; the spaces separate the morae. The *romanisation*, which shows the pronunciation, is /nippoŋ/. With this transliteration, there is a one-to-one relationship between the sounds of Japanese and the Roman symbols. Transliterations are useful in showing how the orthography works; transcriptions are useful in showing how the actual symbols work.

Romanisation is not the only type of change of script of course: speakers of languages using Greek, Cyrillic, Arabic, Hebrew scripts all convert foreign names to their language and script. Chinese assigns characters with a similar sound to represent foreign names (Figure 7).

Sociolinguistics

Many languages are diglossic, where typically one form of the language is used for writing and another for speaking. Chinese and Arabic have been mentioned above; others would be Swiss German and Tamil (south India and Sri Lanka). In German-speaking areas of Switzerland,

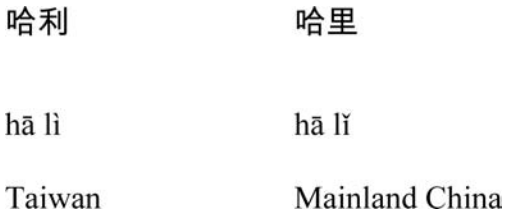

Figure 7 Foreign names written in Chinese. In the Harry Potter novels, *Harry* is shown on the left as it is written in Taiwan, and on the right as written in Mainland China. First, the name *Harry* is pronounced in Chinese: /hali/. Tones have to be arbitrarily given to each syllable, and different tones were assigned to /li/. Then appropriate characters are found for each syllable. The choice of character is based simply on phonetic resemblance; the two countries applied the same principles, but with different results for the second character.

schools and universities are the only places where Standard German would be spoken, otherwise Swiss German is used; conversely, written Swiss German is unusual.

Languages always have dialect variation. Sometimes, one of these dialects is chosen, usually for social and political reasons, as the one conventionally to be used for use in writing. This dialect is often called the standard dialect. Old English (500–1100) writing was rather uniformly based on the Winchester dialect where the capital was located. On the other hand, Middle English (1100–1500) tended to reflect local usage with a wide range of dialectal variation with relatively little sense of a standard dialect. Towards the end of the middle English period, the dialect of the later capital London came to be used as the standard dialect. And after 1500, printing brought further uniformity to English spelling, using the London dialect of the sixteenth century, a usage which has continued to the present day. Despite a few dialectal variations in English spelling in the United States (e.g., *colour – color; centre – center; defence – defense*), English spelling is quite uniform around the world.

In the middle of the twentieth century, the People's Republic of China (PRC) made significant reforms in the writing of Chinese by simplifying a large number of characters, substituting forms written with fewer strokes. These simplified characters are now the norm there. However, Taiwan viewed these characters as 'communist' and has continued to use the traditional forms of characters. People in Hong Kong as well as Chinese speakers outside China have continued using the traditional characters, although more from traditional rather than political motivation. Even the handover of Hong Kong to the PRC in 1997 has not yet radically changed the use of traditional characters there. Today, different computer codings exist for the traditional and simplified characters.

Literacy

Although many illiterate people lead happy and productive lives, being able to read and write is widely considered essential in the modern world. No clear answer exists to the question of what kind of writing system would maximise the efficiency of literacy education. Japanese has the most complicated writing system in use today, yet its illiteracy rate is close to zero. Spanish has a straightforward writing system with close to a one-to-one phoneme-symbol relationship, yet illiteracy has only recently been lowered significantly in many Spanish-speaking countries of Latin America. The choice of writing system is less important for literacy than the amount of money and time a society is willing to devote to teaching it.

H. R.

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